Volume II Number 4

The FRATECH

GRADUATION NUMBER

MAY 1922

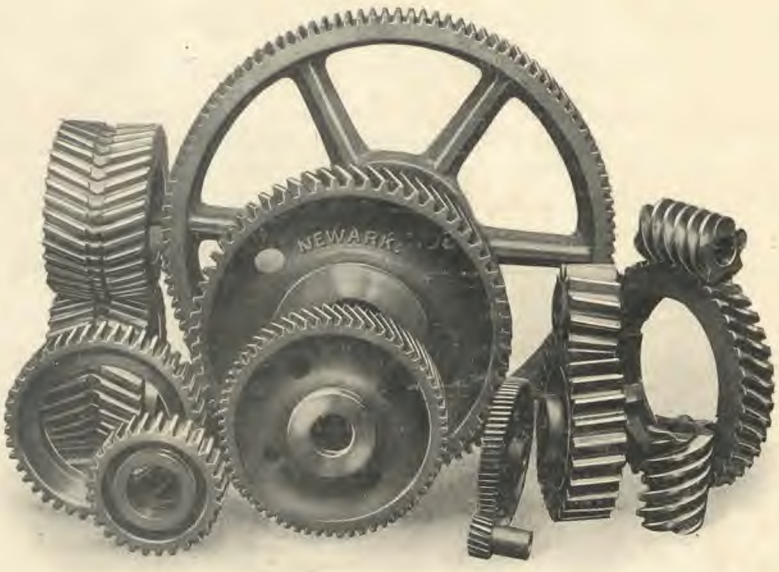
Published in the Interest of the

NEWARK TECHNICAL SCHOOL AND
COLLEGE OF ENGINEERING

of the

NEWARK TECHNICAL SCHOOL

Newark Gears--



Newark Gears are cut on automatic machines, designed and manufactured by the NEWARK GEAR CUTTING MACHINE CO. We have special facilities for cutting gears of all kinds. Spur, helical, bevel, worms and worm wheels, are all accurately cut on our own machines.

Our machines are also in use in practically every Gear Works in this country and in foreign countries, and are cutting gears in machine factories, steel mills, ship yards, electrical works, and many other industries, all over the world.

Manufacturers of Gear Cutting Machinery, Gear Hobbing Machinery and Gears.

Newark Gear Cutting Machine Co.

Henry E. Eberhardt, President.

65-75 PROSPECT STREET (near Ferry Street) **NEWARK, N. J.**

THE FRATECH

PUBLISHED IN THE INTEREST OF AND BY THE STUDENTS OF THE NEWARK TECHNICAL SCHOOL AND COLLEGE OF ENGINEERING.

For Advertising Rates, Address Advertising Manager.

Contributions are cordially solicited from the students and graduates of this school. "Fratech" Contribution Boxes will be found throughout the building

OFFICE: NEWARK TECHNICAL SCHOOL, 367 HIGH STREET, NEWARK, N. J.

THE STAFF

Editor-in Chief
CHARLES S. CARTER, '22

Associate Editors
HELEN B. TUNSTEAD, '23 — ALEX. T. WILLIAMS, '22 — HELEN A. CLARKE, '23

College Editor
ROBERT E. PARKS, '24

Federal Board Editor
G. MCKINLEY TRIESCH

Associate College Editors
IRA BERGMAN, '24 — ALFRED BURNS, '24
CARL P. MANNHEIM, '24

Radio Editor
HAROLD F. SCHUMACHER, '22

Business Manager
ALFRED W. SAUNDERS, '22

Advertising Manager
CHARLES L. FENNIMORE, '22

Assistant Advertising Managers
GORDON H. CAMERON, '24
EDWARD PRAIZNER, '22

Circulation Manager
WILLIAM ATNO, '22

Assistant Circulation Manager
CHARLES KENLAN, '23

Staff Artist
JOHN P. MIELE, '24

Reporters
GEORGE FREUND, '22 (Chief)

HENRY REID, '23
JOHN P. MIELE, '24
HARRY FAAS, '23
EDWARD J. ACKERMAN, '22
FRED G. EBERHARDT, '23
ROY ANDERSON, '24
JOHN LANDERS, '23
FRANK GOODRICH, '23
JAS. H. WILSON, '22
RALPH STORK, '24

THE FRATECH

CONTENTS

ENGINEERING AND MATHEMATICS

By Dean Cullimore

The real value of mathematics to engineers is a question that has caused and is causing much discussion among men who are interested in the training of young men for the profession of engineering. The discussion is not confined to educators alone, but practicing engineers and engineering students are, and always will be, interested in the uses and abuses of a subject which plays such a large part in the training of men in all of our best engineering schools.

It is not within the scope of this article, or within the power of the writer to settle this discussion. But a few of the more important factors having to do with the function of mathematics in a training in engineering may be presented and prove of interest more especially to those students who are interested in the whys and the wherefores of the subjects which make up the courses in the Newark Technical School.

In drawing up or outlining a course of study, modern practice is first to make an analysis of the project in hand; to divide the sought-for requirements into simple factors, and to give training so that these factors can be efficiently and effectively met. We wish to find out what we want an engineer to be, what we want him to be able to do, and then to arrange a course which will give him the power to do what we wish him to do. If the aim is very specific and very narrow, the course is easy to outline; if the aim is very broad and generalized, the problem becomes much more difficult and we must analyze carefully, handling only such values as are fundamental and vital to his success. If we could know in advance just what position every man was to fill, we could perhaps outline a course for him which would meet his exact need. This is impossible, so we try to find those values which are of greatest worth to the greatest number, those values which are common to all engineers, those values which every engineer must have in some measure in order to be successful in his profession.

The problem, therefore, is a very broad one. In common with all men an engineer must be able to start, to follow and to bring to a successful completion work for which he is responsible. He must initiate, develop logically and successfully conclude his problems if he is to be in the highest extent successful.

In our present industrial system, however, work is so apportioned, so divided that these three factors are seldom done by one man, and it usually falls to the lot of the young engineer to be a part or a factor in only one of these divisions, and he is called upon to do his part in logically developing a portion of the whole scheme or the whole work in hand. To be specific, it falls to the lot of the individual to develop a detail of a broader scheme; to take this detail, develop it to a certain point and pass it on to another who adds further to it, so that the detail passes through successive stages of development until it is ready to be with other details assembled into a complete production.

As the engineer grows older, he becomes familiar with many of these details. He sees and appreciates their relation one to another and finally he may, if he has the capacity, be charged with the initiation and the assembly, as well as with the development.

In any case, however, our first duty is to teach him to develop, or as we may say, to solve certain problems. It would be better perhaps to say that our duty is to so direct him that he may acquire the power to solve a wide variety of problems, the problems of his profession. We wish to develop power, power to advance to a solution. We do not wish to give him information except in so far as this information furnishes the basis for mental power or mental action on his part.

This power must be the power of straightforward, scientifically honest, logical thought, and like all power it becomes greater if the time element is

(*Continued on page* 28.)

THE MENHADEN AS A SOURCE OF FISH OIL AND FERTILIZER MATERIAL

By Professor Robert G. Merz, B.S., M.E.
Mem. A. S. M. E.

Some twelve years ago the writer had occasion to lay out many plants for the conversion of fish and fish offal into oil and fertilizer material and to design special machinery for use in connection with same. Naturally the source of supply of the raw material, its composition, characteristics, etc., were of great importance in such design and required extensive investigation because of the scarcity of data on the subject in technical works and scientific publications.

The following article is based largely on notes gathered by the writer during the investigation above mentioned as well as from personal observation and experience at the reduction factories where this material is handled.

Although a considerable quantity of waste or refuse fish from the sardine canneries on the Atlantic Coast, the salmon and tuna fish canneries on the Pacific Coast and the fish dressing industry on the Great Lakes, is worked up for the recovery of the oil and fertilizer, by far the largest quantity of these products is obtained from the body of the menhaden or "mossbunker," a member of the herring family. This is a very oily, non-edible fish, with an abundance of bones, quite similar in appearance to the common herring, though somewhat larger and more robust, varying from eight to fifteen inches in length and weighing ordinarily from one-half to one and one-half pounds.

The menhaden is found all along the Atlantic Coast of the United States from Maine to Texas, but most abundantly between Cape Cod, Mass., and Cape Fear, North Carolina. During certain years it also occurs in enormous quantities off the coast of Maine but in recent years, comparatively few of these fish have been seen there.

With the approach of warm weather, ranging from March and April in the Chesapeake Bay to May and June on the Maine Coast, the menhaden appears and generally remains until late in autumn. Although it may be found anywhere from the inland limits of salt water to the Gulf Stream, especially in the bays, sounds and river outlets, the major part of the catch is made within two miles of the coast line.

The menhaden is essentially a surface-swimming fish and invariably travels in schools. On the other hand, weather conditions, especially the temperature of the water and the presence of enemies have very great influence on the action of these fish. Frequently they will inhabit certain waters in enormous numbers for many weeks, but in such scattered condition that they cannot be caught successfully in nets. At such times they appear on the surface only at intervals and then under the most favorable weather conditions.

Although comparatively little is known of the habits of this fish, it has been quite definitely established that the menhaden seeks the shores mainly for the purpose of feeding and not to spawn. Data and information, which has been collected by the U. S. Bureau of Fisheries and extending over many years, indicates that these fish spawn principally in the warm waters south of the United States, probably in the Caribbean Sea and chiefly during the months of January, February and March.

On their journey northward, these fish do not follow the coast line but remain some distance out at sea, striking in near their usual feeding grounds. At such times they are found in enormous schools, and are generally located by a slight ripple on the surface of the water or by oil spots floating on the sea.

The fishing steamer, which is sent out from the reduction factory, cruises about the usual haunts of the menhaden and when a school is sighted, rapidly lowers the two seine boats. Each of these boats carries one-half of the purse-seine and they start quickly in opposite directions, dropping the net as they go. Gradually they turn towards each other, thus surrounding a great body of the fish and when the two boats meet, the purse string is drawn tight, forming a closed net in which the fish are entrapped.

These seines are of large size varying from 750 to 1,800 feet in length and from 75 to 150 feet in depth and are provided with the usual cork floats and sinkers.

The fishing steamer now draws close to the mass of struggling fish, caught in the purse-seine, and by means of a large scoop-net, suspended from a gaff on the mast and hoisted by power on the steamer, quickly transfers the entrapped menhaden to the hold of the vessel. In the meanwhile the seine is gradually being drawn upward and again deposited in the two seine boats. If a sufficient quantity of fish has not been obtained, this operation may be repeated until the hold of the fishing steamer is filled, when a quick trip is made to the reduction factory to unload the capture. The steamer then returns to the fishing grounds to make a second haul if the school of menhaden is still to be found.

These vessels are built especially for the work required of them, being quite fast and of considerable size, usually 90 to 150 feet in length and capable of carrying from 300,000 to 1,200,000 fish (approximately 100 to 400 tons). All the

machinery is located aft, the lookout and mast being forward, thus providing a large open hold amidships for the reception of the fish. They carry a crew of from 17, for the smaller, to 24 men in the larger sizes. The large vessels usually have two purse-seines and four seine boats.

On arrival at the reduction factory, the fish are quickly removed from the hold of the vessel by means of a continuous bucket elevator of from 60 to 150 tons hourly capacity, similar to those employed for handling coal and grain in bulk at dock terminals. The lower end or boot of the elevator is dropped directly into the mass of fish, whence the moving buckets dredge up the fish, raise them to the desired elevation and deposit them upon a conveyer, extending over the fish storage bin or into weighing hoppers, from whence they are conveyed to the bin. It is essential to unload the fishing vessels very rapidly so as to permit their early return to the fishing grounds for another haul.

In all cases the fish must be weighed since the captains of the fishing steamers are paid on the basis of the quantity of fish delivered to the factory. Practically all the modern plants now weigh the menhaden directly on the conveyor, which is fitted with an automatic recording weighometer of the integrating type.

The large fish receiving or storage bin is invariably located on a dock of wooden pile construction, extending out over the water, thus permitting the fishing vessels to tie up at the dock for unloading their catch. These bins are frequently of very large size, often holding 600 to 2,000 tons of menhaden. They are built of timber of rectangular shape and having the base sloping from each side toward a longitudinal center trough fitted with a removable sectional cover. In this trough runs a long drag conveyor, consisting of two parallel endless chains between which every two or three feet, wood flights are attached and this serves to transport the fish as required to the cook house of the reduction factory. A false bottom, constructed of a series of wooden slats, is provided in the bin to permit of draining the water from the fish and in some cases to recover a certain quantity of oil which is expelled from the fish bodies under the heavy compression of the mass due to their great weight.

In order to extract the oil from the menhaden, it is necessary to break up the oil cells and this is accomplished by subjecting the fish bodies to the action of high temperature steam. The smaller factories employ open wooden cooking tanks for this purpose, but all of the large and modern plants make use of a horizontal Continuous Steam Cooker which operates automatically and requires no labor for filling or discharging.

Such a continuous fish cooker consists essentially of a stationary horizontal steel plate cylinder about two or three feet in diameter and from thirty to forty feet in length, fitted with an intake hopper at one end and a special discharge opening at the other end. The lower portion of the cylinder is provided with several longitudinal rows of steam inlets or nozzles so placed that jets of live steam can be forced directly into the mass of fish moving slowly over the inner surface of the cooker shell. A hollow shaft, rotated by means of suitable gearing and supported in the two heads of the cooker, extends through the longitudinal center line of the cylinder. This shaft is fitted with a specially constructed conveying helix by means of which the fish mass is gradually advanced through the cooker.

When properly operated, such a machine will readily handle from thirty to sixty tons of fish per hour, depending upon its size, cooking the material thoroughly and evenly, and reducing the whole to a soft pulpy mass containing 75 or 80 per cent. of water. The cooking machine, which receives the raw material by a mechanical conveyor directly from the storage bin on the dock, is installed preferably on an elevated platform in the cook house, above the pressing apparatus. The latter, because of the very heavy work required of it, is invariably located on the ground floor and rigidly secured to a solid concrete foundation.

While some of the smaller factories still employ the hydraulic curb press for removing the major part of the water and oil from the solid portion of the cooked mass, all modern reduction plants now use some form of the horizontal automatic continuous screw press, because of the very great saving in labor with the latter type. This machine is composed of a heavy frustro-conical cast steel curb frame, having a suitable intake hopper and fitted on the interior with a large number of tapered and beveled edge, longitudinal steel slats, spaced about one thirty-second of an inch apart. A closely fitted pressing screw, conforming to the interior slatted surface and mounted on a large hollow steel shaft, is rotated very slowly, through heavy gearing, within the slatted drainage casing.

The hollow shaft is provided with a great number of small steam nozzles, between the convolutions of the pressing helix and fitted with suitable stuffing boxes at each end for connecting up with a high pressure steam supply. This arrangement permits of forcing jets of steam directly into the cooked mass while under heavy pressure in the machine, serving to keep the material in a highly heated condition, which is essential for maximum oil extraction, as well as to prevent clogging.

The cooked fish pulp enters the press directly from the cooker in a continuous stream and a thoroughly pressed and matted mass, called pressed scrap, is discharged continuously from same at the opposite end. The intense pressure to which the material is subjected results in an expulsion of most of the water and oil through the slatted curb of the machine.

(*Continued on page* 30.)

A TABULATION METHOD FOR RATIOS

By Professor Archibald Craig, A.M.

A problem of ratio and proportion presupposes that in two situations the same relations exist between two kinds of quantities. Example: If 12 eggs cost 50 cents, how much will 24 eggs cost? It is here assumed that the relation between eggs and money is the same in both cases. Problems dealing with conversions of weights and measures and with chemical and physical changes likewise assume that the relations between these quantities are invariable. It is necessary, therefore, before using this method, to know whether there is such a constancy of relations, and to know whether the ratio is direct or inverse. There is often great difficulty in making sure of the correct statement of proportions, particularly when the calculator is not familiar with the operations concerning which the calculation is made. Often one may remember the rule, but owing to the great interests at stake, a mistake entailing loss of money or position, one needs the comforting assurance of a method of checking his calculation. The writer has worked out a scheme for stating problems of ratio and proportion that has some advantages in the way of clearness and accuracy.

1. In any problem, make a series of columns, heading each with the name of a kind of quantity, so that all quantities of the same kind shall be in the same column. For instance, eggs, cents.

2. Quantities in one horizontal line under the different headings must be known to have a constant relation to each other. All must be facts which are at the same time true of one particular thing, expressed in quantities described by their column headings. For instance, 12 under eggs on the same line with 50 under cents.

3. If any four quantities in any part of the chart form a rectangle, the product of two opposite corners is equal to the product of the other two opposite corners, and if one quantity of a rectangle is missing, it may be supplied by multiplying the given opposite corners and dividing by the odd corner.

4. Rectangles may be filled in any order, but there is economy of attention and operation in filling corners in the same line with the place of the quantity desired, either vertically or horizontally, until a rectangle is formed including the quantity desired.

5. The calculation may be checked by filling rectangles in the other line from the quantity desired until it has been reached without using any of the corners filled in the first solution.

6. For convenience, *underscore* all quantities found by observation. Enclose in "quotes" all quantities used as statements of general truths, as for instance constants taken from books.

Enclose in (braces) all quantities found in the first line of calculation, placing the braces ( ) before beginning the calculation.

The second line of calculation may be left unmarked.

Example 1. The price of eggs is 12 for 50 cents. The grocer gives 2 coupons with each 25 cents worth of purchases. What will 18 eggs cost, and how many coupons will be given?

Eggs	Cents	Coupons
18	(75)	(6)
"12	50"	4
	"25	2"

In this solution, the first line of operations is $18 \times 50 \div 12 = 75$, $75 \times 2 \div 25 = 6$. The check calculation is then made in the vertical line. $50 \times 2 \div 25 = 4$. $18 \times 4 \div 12 = 6$. As 6 has been obtained by two entirely separated calculations, not only it, but the intermediate results, have been checked, subject, of course, to the accuracy of the original information.

Example 2. How many cubic centimeters of Nitric Acid, 69.8% pure, density 1.42, will make a liter or normal solution?

Cubic Centimeters Normal solu.	Grams of Pure HNO_3	Grams of Reagent HNO_3	Cubic Centimeters Reagent HNO_3
"1000	63.018"	(90.28)	(63.58) 63.58
		"1.42	1"
	"69.8	100"	70.42

By definition, a liter of normal HNO_3 contains one gram molecule, obtained from the atomic weights. The density is expressed in the form of an equation, 1 cc weighs 1.42 grams. If the term specific gravity is used it comes to the same thing. The volume of a gram of water= 1 cc,=1.42 grams reagent HNO_3. Percentage is expressed in the equation 100 parts by weight of reagent HNO_3=69.8 parts, in this case grams, of pure HNO_3.

Example 3. In the reaction $3SnCl_2 + 4HCl + KClO_3 = 3SnCl_4 + KCl + 2H2O$, how many grams of $KClO_3$ will be required for 5 grams of Sn, and how many cc of reagent HCl, 37.23% pure, density 1.19, will be neutralized?

3Sn Grams	4HCl Grams	$KClO_3$ Grams	Reagent HCl Grams	Reagent HCl cc.
5	(2.0434)	(1.717)	(54.89)	(4.61) 4.61
"357	145.90"	122.56"		329.3
			"1.19	1"
	"37.23		100"	84.04

Here the molecular and atomic weights, which we call in calculations the combining weights, are put in columns headed grams, as they may be expressed in any unit of weight. The columns for Sn and HCl contain the co-efficients of the equation, 3 and 4, as guides in calculating the combining weights. These co-efficients do not affect the values below, which are merely grams of Sn and HCl. As the weight of $KClO_3$ found is not a part of the HCl calculation, its accuracy is not checked. The proper check is to divide end pairs instead of multiplying corners.

Example 4. How many pounds of commercial sulphuric acid, 93.19% pure, will be required to neutralize 12,000 gallons of a solution, if 500 cc of the solution required 50 cc of normal acid?

In using conversion factors for English and metric systems it is necessary to make sure that the two parts of each equation fall under headings that describe the same kind of material as well as the proper kind of unit for each part. It would not do, for instance, in the equation 1 lb= 453.6 g, to put the 1 under lbs. commercial H_2SO_4 and the 453.6 under grams pure H_2SO_4.

Gallons Solution	Lbs. Com. H_2SO_4	cc Solution	cc Normal	Grams Pure H_2SO_4	Lbs. Pure H_2SO_4
12000	(526.9) #5 526.9	(45 420 000) #1	(4 542 000) #2	(222 740) #3	(491.49) #4
	.0058010#3	500	50		
	"100				93.19"
	.11602#2		"1000	49.04"	
	107.31#1			"453.6	1"
1"	.043913#4	3785"			

(*Continued on page* 32.)

THE VULCANIZATION OF RUBBER

By D. C. Capasso.
3rd Year General Technical Course.

After India rubber was introduced to the civilized world, scientists and inventors were quick to recognize in it a material with wonderful possibilities for the manufacturing of waterproof clothing and numerous other articles of utility and value. From that time on, extensive experiments were performed and millions of dollars spent for the manufacture of rubber articles.

Practically all of this money was lost because the products proved unsatisfactory. In New England and elsewhere expensive factories were erected to produce rubber goods, but all failed due to the fact that the method of making rubber was quite far from perfection. The main difficulty encountered in those days was how to remedy the inherent defects of the raw rubber or gum. In cold weather it became stiff and almost brittle, while in hot weather it would get soft and melt into a thin, gummy, evil-smelling mass and perhaps decay. The small quantity of rubber goods that merchants were able to sell proved to be an active source of dissatisfaction and complaint while that remaining on the shelves rapidly decayed and became a nuisance because of its unbearable smelling qualities

It was Charles Goodyear who, after long years of patient study and experiment, discovered how to make rubber permanently elastic and proof against temperature changes as well as other conditions that caused its destruction in the raw state. Goodyear's process, known as vulcanization, converted the practically useless gum into one of the most indispensable materials of commerce, a material which now enters into the

(*Continued on page* 32.)

SAMPLING

By V. T. Stewart, Ph.B., B.S.

The object of sampling is to obtain a small quantity of material containing the same proportion of all constituents as the main lot which it represents and which is suitable for analysis. The utmost accuracy would require the submission of the entire lot to the process for which it is intended, accompanied by accurate measurements of a suitable nature. This is well-nigh impossible and in any event, far too expensive. The sample thus becomes the basis of the inspection and any subsequent complaints or settlement.

This subject was discussed recently before the chemical engineering students and the Director called attention to the fact that sampling is analogous to the operation of differentiation of calculus. The sample stands for the whole and, for purposes of inspection, acts as the whole would under corresponding circumstances.

The basis of the care and attention to be given the sampling of a particular lot, is the amount of money involved. That is, a large shipment of valuable material justifies more care than a small shipment of the same thing. Roughly, a large shipment of low-priced material should be given the same consideration as a small shipment of valuable material.

There is no phase of the testing of materials, which justifies more care and which usually receives less than it needs, than the taking and preparation of the sample, particularly for chemical analyses. The personal equation enters into the problem to a very great extent and the formulation of standard methods can at the best go only part of the way toward assuring an honest sample. The work calls for a high degree of personal honesty and conscientiousness. It is very easy for the sampler to do a little less than he knows is expected of him and generally it is not a simple matter to check him up. The situation is further complicated by the fact that the sample usually must be taken while the material is being unloaded, which is an excellent time, due to the fact that a thoroughly representative sample may be taken with a minimum of work, and that the ordinary routine of the plant is not disturbed. However, the serious disadvantage is that, once the material is unloaded, it loses its identity, either going into the manufacturing operation or into storage, where it is mixed with other lots of the same kind. Furthermore, plants usually hesitate to hold stock, pending the results of the analytical work. This becomes especially serious when the stock is ore which bears valuable metals, or bullion. It is, therefore, evident that while the work of the analyst can be repeated and checked, that of the sampler cannot. Of necessity, the work is carried out under circumstances which are not conducive to the taking of pleasure in one's work. So altogether, a thoroughly competent sampler is deserving of a great deal of appreciation.

Experience shows that the sample taken by a green man is usually too good. He is prone to pick out the nice appearing pieces, whether consciously or not. The check on sampling is the agreement in the results of the analytical work on two samples of the same material, taken independently.

Only the material to be paid for, should be sampled. If part of the shipment is obviously unfit for use, the sampler should at once bring the matter to the attention of the proper officials and obtain a decision as to whether or not the whole shipment will be received at its depreciated value, or the unfit material shall be sorted out and only the fit part accepted. The sample is based only on the material accepted for use. It sometimes happens, for example in the manufacture of food products and paper, that the raw materials contain objectionable constituents, which can be sorted out, and which, if allowed to remain, would be positively harmful. Portland cement, which has become wet in transit or storage is worthless for construction purposes. The sampler should determine whether that part of the shipment, which has been wet is to be accepted. If so, the sample should contain as nearly the same proportion of the slacked cement as the shipment. If not, the rejected material should be removed before the sample is taken. It sometimes happens that the stock under consideration has become damp through exposure in transit or in storage and without any ill effects, beyond the increase in weight. The usual procedure in such cases is to take a special sample, work it up as quickly as possible and with the least amount of grinding friction, weigh out a quite large sample, say a few pounds, dry it in an oven at about 110°C, and reweigh. The loss during the heating is calculated to the percentage of moisture in the lot. This is necessary on account of the fact that the moisture content, especially of small quantities, changes with surprising rapidity. The other analytical work is performed upon the main sample, which is brought to bone-dryness before any work is done upon it.

For the sampling of ore, coal, or any other bulk material, it is excellent practice to take small quantities during the unloading. It is much better to take a large number of small quantities than a small number of large quantities. Obviously, the selections should be taken at regular intervals. The gross weight of the sample will vary with the nature of the stock, a smaller sample will suffice the more nearly uniform the stock. Five hun-

(*Continued on page* 34.)

"THE FRATECH" AND THE 1923 STAFF

Before introducing the Staff that will carry the FRATECH to victory during the coming year, it is deemed expedient to set forth a few pertinent facts pertaining to our paper and to you.

The organization, aim and purpose of the FRATECH were excellently presented by the 1921 staff in their final issue and will be but briefly reviewed here.

The FRATECH is the official publication of the Newark Technical School and College of Engineering of the Newark Technical School. It is not connected with any other organization of the school. It is not endowed and receives its financial support from advertisements in and sales of the paper. An unpublished financial statement is made and audited after each issue, the gain on any issue is used to improve subsequent issues and all funds remaining at the termination of one staff's term of office are turned over to the succeeding staff. Its executives are usually chosen from the senior class and no member of the staff receives any remuneration for his services nor special privileges by virtue of his office.

The purpose of the FRATECH is unique. Although it is not associated with any other organization of the school, its purpose is to serve them all. A casual scrutiny of its pages will make this statement obvious.

Its aim is to promote social relationship within and without the school; to be the medium through which the budding engineer may express his ideas; to be the conveyor of interesting information from the instructors to the student body as a whole; to be the reviewer of all events pertaining to the school and its various organizations; to follow up any subject of value and interest to the students; to be the connecting link between the outside world and our institution and last, but of paramount importance, to make you see the bright side of life—even at your own expense—through its joke columns.

With the foregoing as a preamble, we of the retiring staff, feel highly honored in presenting the names and offices of the personnel of the 1923 FRATECH Staff:

Editor-in-Chief, Clifton J. Keating, '23.

Associate Editors—Helen B. Tunstead, '23, Henry Reid, '23, George Miller, '24, Charles Fousel, '23.

College Editor—Robert E. Parks, '24.

Literary Editor—Helen A. Clarke, '23.

Business Manager—Fred Eberhardt, '23.

Assistant Business Manager, Frank W. Goodrich, '23.

Circulation Manager—Harry Faas, '23.

Assistant Circulation Manager—John Landers, '23.

Advertising Manager—Charles Jenkins, '23.

Assistant Advertising Managers—Joseph O'Connell, '23, Elwin Crutchlow, '24.

Associate College Editors—Ira Bergman, '24, Carl P. Mannheim, 24.

Publicity—Herman Zieschang, '23.

Staff Artist—Roy Anderson, '24.

Reporting Staff—Ralph W. Lindeman, '23, (Chief), Aug. J. Littman, '23, Edward Walsh, '24, Joseph Zwingel, '24, Theodore Newitz, '24, Ralph Stork, '24, Adolph F. Curette, Jr., '23, Robert Pierson, '24, William Schuler, '24, Joseph Furey, '24, D. C. Capasso, '24.

Students, instructors, graduates and friends of the school; this is your paper. It cannot rise to any great height without you. It is your privilege, and to say the least, duty to buy a copy of every issue. The yearly subscription list should contain the names of every instructor in the school, of all upper classmen and graduates. If our instructors support us—a precious few have not done so this past year—we can ask for the student support, and so on to the graduates and friends. Get your name on the list.

It is axiomatic that the paper cannot succeed without advertising. It is also self-evident that concerns will not advertise without results. To use a much used, much abused, but still a forceful expression, patronize our advertisers and mention

the FRATECH at the time of the transaction. If our advertisers cannot give you the same and even better service, merchandise and price than non-advertisers, then you are entitled to go elsewhere.

In conclusion it may be said that no matter how diligently the staff of 1923 may work, the prominence of the FRATECH and the prestige of the school are forever interlinked with you. You cannot pull yourself up with your own bootstraps, you should not live for yourself alone. If you want assistance, assist.

EASTER, APRIL 16, 1922

The festival of EASTER, commemorating the resurrection of Christ, was fixed by decree of the Council of Nicea in the year 325 A. D., for the Sunday immediately following the fourteenth day of the new moon which happens on, or first after the vernal equinox. The vernal equinox invariably falls on March 21. Under this calculation EASTER cannot occur earlier than March 22, or later than April 25th.

The ecclesiastical year of 1912-1913 caused surprise because of the early date of the festival, which then occurred March 23, one day later than the earliest date upon which EASTER may fall. In 1916 the feast was exactly one month later, and two days earlier than the latest date upon which it may occur. Thus within four years the change covered all but three days of the whole variation possible.

During the period from 1786 to 2013, over which the days of EASTER are given in the Book of Common Prayer, that feast falls on April 23rd four times; on April 24th three times, and twice on the 25th, which is the latest date possible. Thus in 227 years EASTER occurs as late as April 23 and later, as follows:

April 23, 1848, 1905, 1916 and 2000;
April 24, 1791, 1859, and 2011;
April 25, 1886, and 1943.

The festival occurs in April 175 times of the 227 years. This year it occurs on April 16.

PASSOVER OCCURS AT SAME TIME

The annual feast of the Jews, instituted to commemorate the sparing of the Israelite firstborn and the escape out of Egypt.

At this festival the Israelites while they remained in possession of Palestine, assembled in the tabernacle and from Solomon's time in the temple. During the eight days of the feast they were commanded to eat only unleavened bread, in commemoration of their hasty departure from Egypt when they were obliged to take their dough with them unleavened; hence the name of "Feast of Unleavened Bread."

The Hebrew word Pesach recalls to the Hebrew the act of the Destroying Angel in "passing over" the houses of the Israelites, which were marked with the blood of the paschal lamb, when he smote the Egyptians. (Exod. XII.)

THE END OF THE BEGINNING

At last we have reached the end, not the finale, but the end of the real beginning of our education; not the finish of our relationship with Newark Technical School, but the end of our acquaintance and the beginning of that deeper friendship and love for our institution; not the bursting of the bonds of the fellowship of classmate, but the superceding of that bond by the greater tie which holds men together who have worked and succeeded in a common pursuit.

The most ignorant man in the world might be defined as one who has a complete knowledge of everything. Actually education ends only with death. It may be likened to the opening of a door, only to find two doors and beyond these two, four doors and on and on so that in a literal sense, we who know that we don't know, will never complete our educations but will find an ever-increasing field yet to be exploited. The very term of our graduation exercises, "commencement," belittles the idea that we are finished. It is true that each one of us may cease following a particular course of study, that acquiring knowledge at fixed periods will perhaps be ended, but we shall go on adding new ideas, assimulating new theories and developing mentally until the end.

To state that the end has been reached with the Newark Technical School is as absurd as to feel that our educations have been completed. This institution is the rock upon which our structures of education and school sociability have been founded and it shall continue to be our guide-post in the future as in the past. Our desire to repay part of the debt which we owe to it will be ever present; our interest in its organizations cannot wane; we may even return to follow up some pet subject of ours. All of these serve to unite us closely and more closely to it. Ended with Newark Tech? No, we are just starting.

This is not the end of our bond of sympathy between one another as classmates. Where men have planned and studied together week after week, year after year; where they have taken active part as a unit in organizations, in class activities, friendships of the acid-test type are formed. These friendships will not cease upon our graduation, but will flourish and develop until they symbolize in word and deed the true significance of the words friend and classmate. Although we will not meet as frequently as heretofore, those reunions, both formal and informal, which we do have will not only cement the friendships formed, but will become a joyous part of our social existence.

Since we are not finished with our education, since we are in no wise severing our connection with Tech, since we are just about to become better acquainted with our classmates, this is not our valedictory but more truly our salutatory.

CLASS OF 1922

Class of 1922

RESUME OF THE ACTIVITIES OF THE CLASS OF 1922

Now that the time for graduation draws near for the members of the Class of 1922, no doubt many of us are starting to feel that characteristic feeling which compels us to look backward and recall to memory the many hours we have spent at "Tech."

Surely, it is with pleasure and sorrow that we are about to terminate our frequent, periodical visits; pleasure in having completed the task we undertook, sorrow in the fact that we shall not see each other so frequently. Surely, every member of '22 will overcome the latter by becoming a real alumnus, supporting its aims and principles as faithfully as we have endeavored to support our class.

It is and probably always will be a difficult undertaking to have frequent, elaborate social affairs in an evening school like Tech where all of us are so pressed for spare time but, who amongst us does not look forward eagerly to the events of the "Frat" and the class events of the school?

Our class meetings and the few social affairs which we have had, have assuredly been a boom to good fellowship in our class. Though we have had differences and "scraps" over business problems, they have only resulted in bringing us the more closely together until now, at almost graduation time, we are all united under the common bond of "Good Fellowship."

As a class we have had some wonderful opportunities to set precedents as we are the first class to have members who will graduate from the new Associate Engineering Courses, thus setting an epoch for Tech's Future Engineers.

One of the precedents which we as a class claim is the adoption of a Key symbolical of engineering, instead of a Pin as all other classes have done before.

We are quite proud of our opportunity, but taking advantage of it has meant an enormous amount of time and labor to practically every member of the Class of 1922.

We have labored with patience and care, not merely to select a Key for ourselves, but to select one which would appeal to all future classes so that we would not necessarily be wearing an insignia of the class of 1922 but an insignia of "Our School."

The logic of a standard key should be quite evident when we consider what has been the results of previous years. Every class which has ever graduated from Tech has had its own separate insignia, with the general result that no person outside of that particular class knows what the insignia looks like and consequently its value is lost.

Now if we, and by "we" is included the Class of '22 and all future graduating classes, will adopt a standard insignia so that say forty are worn this year and forty more next year, then as the years progress we shall have an insignia which will mark a "Tech" man and not necessarily a class of such and such a year man.

To the Class of 1923, who have helped us in the selection of the Key, we feel very grateful and we hope that the Class of 1924 will give unto you the support which you rendered to us, not only in this one problem, but in the many in which you supported us. We thank you. We also wish to extend our thanks to Mr. DeWitt, Instructor of Freehand Drawing for his valuable aid in making and selecting designs for our Key.

Another thing in which we feel our Class has done "their bit" successfully has been in the handling of the FRATECH. This paper which has been for years the official organ of Tech has been carried forward over many hardships and with the result of much labor by our predecessors before it was turned over to us. We have done the best we could and now we feel that the paper under the excellent guidance of our Editor-in-Chief, Mr. C. S. Carter, is equal to any college paper in the country.

In conclusion, the writer wishes on behalf of the Class of 1922 to thank Dean Cullimore for his many words of advise, encouragement and support which he has so generously given to us at all times. To the many Instructors who have labored in our behalf we are grateful beyond words, words which fail to express our appreciation for your years of effort for us.

To the members of 1922 who elected me, I feel keenly grateful for the honor which you have bestowed upon me. It has been a pleasure to work with you and it has been through your aid and suggestions that we have made "Our Class" something which we should all feel it an honor to say that we are members of the Class of 1922, Newark "Tech."

A. T. WILLIAMS,
President, Class of 1922.

NEWARK TECHNICAL SCHOOL ENGINEERING KEY

With the advent of the Associate Engineering Courses in Tech, marking an epoch in the engineering training which can be obtained here and leading to the degree or title of Associate Engineer (A.E.), the present graduating class with the aid and support of the Class of 1923 have succeeded

in adopting a handsome 14-k gold Key which shall be in the future the symbol of a Newark Tech Engineer.

The design of the Key has been very carefully considered. The Gear Wheel, Retort and Lightning are symbolical of the Mechanical, Chemical and Electrical Courses respectively. The State Seal shows that we are a State as well as Newark institution.

We are greatly indebted to Mr. DeWitt, Instructor of Freehand Drawing for his many suggestions regarding the design and for the pen and ink sketch from which the cut for this article was made.

To Mr. Edward Ackerman and Mr. Leroy Heist who have worked untiringly to obtain the best possible designs and prices, we are exceedingly grateful since it is almost entirely through their efforts that we have been crowned with success.

THE TRUTH ABOUT THEM

Chemical

COOPER, HARRY

His favorite drink is water. His favorite occupation is loafing. He hates to study, so he has no favorite instructor.

CARLSON, E. M.

His favorite drink is grain alcohol. Like Cooper, he has no favorite instructor. His nickname is "Mach." His favorite occupation is getting his.

DICKSON, R. A.

His favorite drink is condensed milk. His favorite occupation is working. His favorite instructor is Dr. Crane. His nickname is "Dick."

PENNAECHINI, L.

His favorite drink is, oh, well, it can't be had, so what's the use? His favorite occupation is reading. His favorite instructor is Prof. Stewart. His nickname is "Penny."

TULLY, THOS.

His favorite drink is H_2O? His favorite occupation is making bombs and gas. His favorite instructor was King Lear. His nickname is "Tull."

Electrical

ACKERMAN, EDWARD A.

We doubt if Ed will ever be rich as he is so anti-capitalistic. However, we all like him and when he is down to his last million we shall still like him.

ATNO, WILLIAM

The class genius is our Circulation Manager. Bill can ask and answer a question at the same time and being thus endowed, he reasoned that he could be married and happy.

CARTER, CHAS. S.

Carter is a living proof that size doesn't mean anything when it comes to being "all there."

FENNIMORE, CHAS. L.

Fennimore is an all-round good fellow. In fact the only fault we can find with him is his insatiable desire to get married.

HOFFMAN, ROBT.

They say that good things come in small packages and "Bobby" is no exception. We are expecting to hear of great things from our Class Secretary.

JACOBITTI, EDWARD E.

Jacobitti is usually very quiet except when he is "bawling out" somebody, but we all like Jack because his outbursts as a rule, are directed against the Profs.

SAUNDERS, ALFRED W.

Another one of 1922's little packages of bigness. Well-liked by us all and a real Lady Charmer. A Business Manager by nature and an Engineer by circumstances.

SCHUMACHER, HAROLD F.

Schumacher is by Divine Right and natural ability the Class Diplomat. He can know less and get away with more than any other two men in the class.

WILLIAMS, ALEX. T.

Williams' chief ambition has always been to make our class the best that ever graduated from Tech. To be convinced of his success one needs only to gaze at the class picture.

Mechanical

HEIST, LEROY

Heist is the class Edison. He has not yet rivaled the Wizard in intelligence, but when it comes to asking foolish questions he can make him look as small as a peanut.

SCHEERER, FRANK J.

As "a point of information" we might say that Frank is one of Tech's old reliables.

General Technical

CALVANO, NICHOLAS
Can tell a good joke with anyone. A good worker and some dancer.

FREUND, GEORGE
Our comedian. Always smiling, but serious and hard at work when necessary.

GELFAND, HERMAN
Our modest scholar. He is always doing things without much comment.

GORDON, EDWARD O.
A regular fellow and a good mixer. A humdinger with the fair sex.

HAGENBRANDT, HOWARD
Displays amazing intellect in his waking moments during class.

JACOBSEN, E. B.
Our boy prodigy, being the star mathematician of our class.

ROEHRICH, CHRISTIAN
If you want to come off second best in an argument, argue with Chris.

RUSSEL, C. A.
He foresees answers to problems so well that invariably he claims that the teacher is correct.

WILSON, JAS. H.
A good fellow to know. One who accomplishes things when he gets started and a congenial chap in a crowd.

Plumbing

BRADY, GILBERT T.
We know him to be a good student, a good mixer and an ever-ready friend.

BROCH, ROBT.
Bob's serene disposition and sympathetic nature will surely aid him to cope with and overcome any difficulties that he may meet in the future.

GILLET, HARRY
Harry would rather have the affectionate regard of his fellowmen, than to have heaps and mines of gold.

HOOPER, RALPH
A buoyant smile, a jolly word, a strong handclasp—put them all together and you have our popular Ralph.

HELLMECK, JOS.
Joe is known for his vim and high-spiritedness. Though at times in despair, he soon is all enthusiasm again.

LINDSAY, ROBT.
Roby has ever evinced a willingness to help along his class.

LAMBERT, EDWIN
Edy is a hard worker who has always taken an active interest in class affairs.

MAIER, CHAS. L.
"Greater men than I may have lived, but I doubt it."

ROTH, MAX
Our comedian. Should have been on the stage instead of wasting his time at plumbing.

RUSSOMANO, ALBERT
Ever willing to do a good turn for a classmate. Al has proven one of the best type of fellow students.

SCRIVO, JAMES
He is the steady plodding type of student that always gets what he goes after. Keep it up, Jimmie.

UNSON, OTTO
Otto is a reserved, conscientious chap, who talks little, but accomplishes much.

CLASS OF 1922 DANCE

On Saturday evening, February 25th, the Class of '22 held a dance in the Laboratory Building. From every possible viewpoint the dance was one of those affairs that we love to carry in our minds' memory as a bright spot in our school life at Newark Tech. The atmosphere, the music and the wonderful spirit of fellowship that prevailed, all combined to make a perfect night.

In one sense our class held this dance as a reciprocation to the Class of '23 for the dance tendered in our honor. The School cannot fail to note the lasting benefits of such class functions as a means of fostering school spirit. We hope that '23 had as fine a time as we did at their dance, held early this year.

F**E**nnimore
Wi**L**liams
Ack**E**rman
Carter
A**T**no
Saunde**R**s
Jacobitt**I**
S**C**humacher
Hoffm**An**
L of a fine bunch.

NOT A DROP LEFT

Hoffman (hurrying into car)—There's a man in the next car fallen in a fit.

Carter—Too late, old fellow, last drop is gone. Man just had a fit here.

Atno—Where do the pieces go when day breaks?

I give up, where?

Fennimore—The same place they go when the night falls.

When is a pretty girl like a ship?

When she is attached to a buoy.

Why is a person with his eyes closed like an inefficient schoolmaster?

He keeps his pupils in darkness.

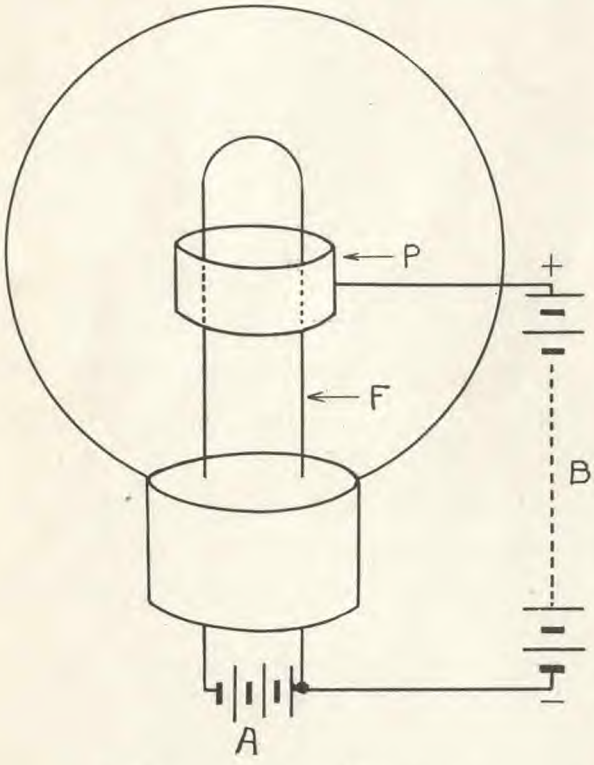
Radio

VACUUM TUBES

By A. W. Saunders. Fourth Year Electrical Engineering

The vacuum tube now holds an important position in the electrical field, especially in the art of communication; in fact it has been claimed as the greatest invention of the present century. These tubes are used extensively in radio, telephone and telegraph communication, hence the subject of vacuum tubes is an important study, but in this article their use will be confined to radio. Vacuum bulbs are also known as—Vacuum Valves, Audions, Pliotrons, Electron Tubes, Thermionic Amplifiers, Oscillions, and many other trade names.

Edison discovered in 1883, during some of his early experiments with the incandescent lamp, that when a lighted filament was within a vacuum and a positive potential was applied to a conductor also within the vacuum a current would flow from the conductor through the vacuous space to the filament. He also noted that the current would flow in one direction only; from the conductor to the filament. This is known as the "Edison Effect."



Fleming Valve.

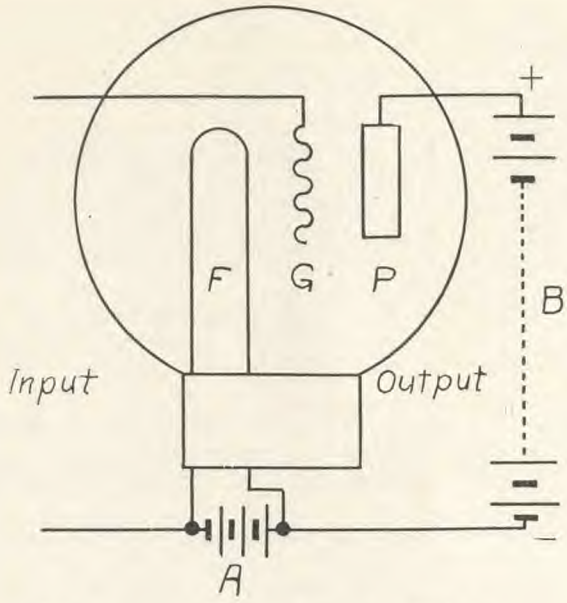
It was Dr. J. A. Fleming, of London, England, who first applied the Edison Effect to the reception of radio signals. His was a two element vacuum tube and worked in the following manner: The filament F emits electrons when heated by the battery A. When the plate P is made positive with respect to the filament by the battery B, these minute negative charges or electrons are attracted to the plate due to the difference in potential existing. The vacuous space between the filament and the plate becomes conductive in one direction only when these electrons are being attracted to the plate P. This was known as the "Fleming Valve" and with which radio signals were detected because of its rectifying action. The Tungar rectifier, used to convert alternating current into direct current, works on this principle.

Dr. Lee De Forest is credited with the introduction of the third element which is now almost universally used in vacuum tubes. This element is in the form of a metallic gauze or "Grid" of fine wire and is placed between the plate and filament. The "Grid" serves to control the flow of electrons from filament to plate because if it is at a negative potential with respect to the filament it will repel some of the electrons because they are negatively charged and will not allow them to reach the plate. As the current flowing from the plate to the filament is determined by the number of electrons flowing from the filament to the plate and as the flow of electrons is controlled by the grid potential, then it is obvious that the plate current is controlled by the potential on the grid.

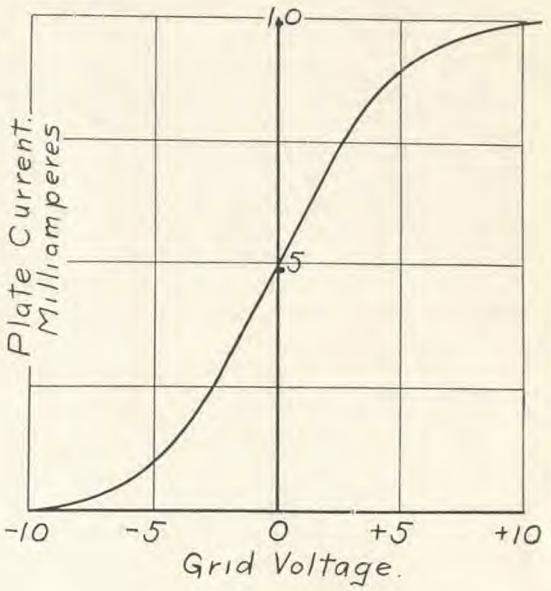
The curve shows the relation between the grid potential and the plate current of a tube, from which it is evident that if an alternating e.m.f. is applied to the grid the plate current will increase and decrease with the variations of this grid e.m.f. This curve varies with different makes and types of tubes and is a very important factor with a given tube.

The battery used to light the filament to incandescence is known as the "A" battery, which, for the smaller tubes used in amateur work, is usually a 6 to 10 volt storage battery. House voltage stepped down to 6 to 10 volts by means of a power transformer is also used, but difficulty is encountered in eliminating the 60 cycle hum of house supply.

The battery used to furnish the plate voltage is known as the "B" battery. For the plate voltage of low powered tubes a battery of between 20 and 60 volts consisting of small dry cells serves very



Three Electrode Tube.



well. It is radio engineering practice to use the highest allowable voltage on the plates of power tubes; the mechanical construction of the tube being the only limiting factor. It will not be surprising if in several years' time as high as 50,000 volts are used on the plates of vacuum tubes.

Vacuum tubes are used for rectifying, detecting, amplifying, modulating and generating alternating currents of extreme frequencies more commonly termed oscillating.

Use as detector.

It was stated above that the plate current was controlled by the potential on the grid. Now if this grid voltage is caused by the incoming radio signals, then the varying signals will cause a corresponding yet amplified variation in plate current. There are two distinct methods of detection or rectification one of which utilizes the grid voltage and plate current characteristic and the other operates with a blocking condenser in the grid circuit. The former method is very inefficient and seldom used so in order to obtain best detection a blocking condenser, shunted by a grid leak, is used in the grid circuit. A grid leak is a very high resistance ranging from 500,000 ohms to 6,000,000 ohms and is usually made up of a thin coating of carbon on a strip of cardboard surrounded by a glass tube with suitable metal terminals or conductors at each end. The purpose of the grid leak is to allow the negative charges to leak off the grid otherwise the negative charge would become so great that it would cut the plate current down to zero. The function of the blocking condenser with a grid leak in conjunction with a vacuum tube is to convert the trains of high frequency oscillations, which are inaudible to the ear, to an alternating current of audible frequency which the ear can readily detect. A detailed discussion of the grid leak and blocking condenser would go beyond the scope of this article.

Sounds above 20,000 cycles cannot be heard with the human ear and as all radio frequencies, with the exception of a few, are above this figure, then in order to obtain an audible sound in the phones, a crystal or audion bulb is used in this manner to rectify the incoming wave train frequency. In the case of radio phone the variations in the voice frequency correspond roughly to the variations in wave train frequency.

This explains why a vacuum tube is far more sensitive than a crystal detector in a radio receiving set, because a crystal only rectifies the incoming wave train while a tube not only rectifies but also amplifies it.

Tube as Amplifier.

The object of an amplifying tube is to receive a small current or wave and increase its amplitude, with as little distortion as possible, the extra current being supplied from a local source. A tube gives greatest amplification when working over the straight or linear portion of the grid voltage and plate current curve where a small change in grid voltage causes a large change in plate current. If two stages of amplification are used and each tube amplifies five times then the two tubes will amplify the output from the detector twenty-five times. A vacuum tube always amplifies regardless of whether it is being used as an amplifier, detector, oscillator, or modulator. Amplifying bulbs are used in both transmitting and receiving.

Tube as Oscillator.

One of the most important uses of a vacuum tube is obtained because of its capability of pro-

ducing alternating currents of high and low frequencies. If some or all of the output of a tube is inductively or otherwise fed back to the input by means of a tickler or variometer the tube will commence to oscillate or bubble. When functioning as such, a tube is said to be oscillating and will oscillate at a frequency determined by the resonance point of the inductance and capacity in the circuit. This fact makes possible a regenerative circuit which feeds back to the input some of the output and by so doing considerably amplifies the signals. A single tube will then function simultaneously as a detector, amplifier, and oscillator and with such a hook-up it is possible to receive radio phone from distances several hundred miles away with only one tube.

Tube as Modulator.

Vacuum tubes as modulators are used principally in transmission work. When operating as a modulator a tube serves to mix the "Carrier" or continuous wave supplied from an oscillating tube with the voice or buzzer frequencies. In modulation a considerable amount of distortion is desired and is obtained by operating a tube on the non-linear or curved portion of the plate current and grid voltage curve.

Bibilography

"Radio Engineering Principles." Lauer and Brown.
"The Principles Underlying Radio Communication." Radio Pamphlet No. 40. Signal Corps, U. S. Army.
"Thermionic Vacuum Tubes." Van der Bijl.
"Proceedings of the A. I. E. E., January, 1922."
"Wireless Telegraphy." Zenneck.
"Electric Waves and Oscillations." G. W. Pierce.
"Radio Communication." Morecroft.

RADIO LIGHTNING PROTECTION

As the summer draws near, thought of lightning protection comes to the radio enthusiast's mind. The danger is not so much one of being struck by lightning—although proper protection of the aerial will largely prevent this—as it is of static getting in to ruin the wireless apparatus.

There are three good methods of protection against lightning, which are, vacuum lightning arrestors, air gap type, and the single pole double throw lightning switch. The first two allow the charge to drain off to the ground while the latter affords a direct connection to the ground.

It is the writer's opinion that the vacuum type is probably the best of the three. This consists of a gap between two contacts in a vacuum. The lead from the aerial connects to one contact and also from this contact to the receiving set while the other contact is connected to the ground. The charge comes in on the aerial, jumps the gap, and thus flows on to the ground. This type can be bought for as low as two dollars.

The air gap type can be home-made.

It is similar to the vacuum type in that it has two separated contacts. But the gap is separated in air instead of in a vacuum. It may consist of two heavy brass or other metal rods filed to a point, mounted on an insulated base, and separated a distance not to exceed one-eighth of an inch. This type is connected in the radio set in the same manner as the vacuum type but is not weather-proof, is subject to corrosion and other elemental influence, and not as desirable as the vacuum type.

The single pole double throw switch should be of the heavy type commonly called the "Antennæ Switch." The aerial is connected to the middle terminal, the set to one end, and the ground to the other end. This method likewise is objectionable since regulations require that it be placed five inches from the building, one needs to reach out and throw the switch from the set to the ground and *vice versa* as the set is needed. Then there is the possibility of forgetting to throw the switch with the subsequent possible danger of no protection to the set at all.

In each of the above cases it is necessary to place the various lightning protective devices five inches from the building and the ground wire must be No. 4 B. & S. insulated wire. This latter may be accomplished by twisting five No. 18 (bell wires) B. & S. wire together.

The ground wire must also be five inches from the building all the way to the ground where it must be securely fastened to a pipe driven deep into the ground or to a large metal plate buried deep in the ground. The distance of five inches may be maintained with porcelain insulators. The above regulations, relative to ground wires, are according to the National Electric Light Code. Whichever method is used it is well to call in the city inspector to pass on the protective device used. Thus a written certificate will show that the building is properly protected against lightning. Then if the building is struck by lightning, the fire insurance policy will not be invalid as far as the radio set is concerned.

DO YOU KNOW THAT—

A single wire aerial is very efficient for receiving radio?

The aerial should be pointed toward the station to be received for best results?

The ground lead should be as direct and as short as possible and be soldered?

Detector vacuum tubes contain gas and are known as "soft" tubes, while amplifier tubes are highly exhausted and are known as "hard" tubes?

In a two-step amplifier better results might be obtained by shifting the amplifier tubes around—due to a slight difference in their characteristics?

Varying B battery voltages enormously changes the reception?

The storage battery should not be allowed to

(*Continued on page* 19.)

Greetings From The School Library

TO THE STAFF

I wish to express my appreciation of the kind words of "The Staff" in the issues of the FRATECH during my recent illness.

When one has fallen victim to the surgeon's skill and knife, it is certainly comforting to learn that after all, we are not alone in the world, but have many sympathetic friends—people who really care.

Of all the many beautiful flowers and cards of tender expressions of sympathy which I received during my illness and convalescence, none were more beautiful and tender, and none more pleasing and more appreciated, than those received from kind friends connected with the Newark Technical School.

It is indeed a pleasure to live again quite free from the suffering to which mortals sometimes fall heir, and to feel confident that in due time the normal strength and full vigor will return. Many thanks to dexterous surgery, clever nursing, and the buoyancy resulting from the good wishes and kind remembrances of my many friends.

Very sincerely yours,
MARY ETTA WILCOX.

It is very gratifying to notice that many students are accepting the invitation to visit the Library who have not been in the habit of doing so, and we have been pleased that we are able to direct most of them to just the information for which they were looking. It is a pleasure thus to help along in the good work. Come in and be at home. If you do not readily find the book or periodical which you are seeking, do not hesitate to ask for it, we know your time is limited and precious, and we shall be very glad to render any assistance possible.

A number of very good books have been added to our collection, and our magazines are replete with interesting information. A few of the articles to be found in these various periodicals are:

Power, March 21, 1922.

"A Modern Power Plant in the Rubber Tire Industry."

"Electrical Equipment of Hydro-Electric Plants."

"The Meaning of Cloud and Pour Points in Lubricating Oil."

Electrical World, March 25, 1922.

"The Business of Radio. One short busy year ago, there were some forty thousand radio receiving stations in this country. To-day about one million people have installed wireless sets and are listening to the broadcasting, picking up bits of 'commercial code' and taking the time from Arlington. In all the spectacular history of electricity there is no such story of phenomenal success."

"Industrial and Station Practice."

"Manufacturing and Distributing."

Municipal and County Engineering, March, 1922.

"Federal Government Seeks to Solve Heavy Motor Truck Problem."

"Constructing 17¼ Miles of Brick Paved Roads in Scott County, Iowa."

"Discussion of a Drainage Expert's Idea on Highway Construction."

Chemical and Metallurgical Engineering, March 22, 1922.

"The Explosibility of Ammonium Nitrate."

"X-Ray Data on Martensite Formed Spontaneously from Austenite."

"The Problems of the American Shale-Oil Industry."

Electrical World, March 4, 1922.

"Far-reaching Influence of the Radio Telephone."

"European Practices Tend Toward Greater Economy."

"The Electrical Manufacturing Industry."

Scientific American, April, 1922.

"Applying the Lessons of Industry to the Theatre."

"At the Sending End of Radio—Spanning the Atlantic with Fifty Watts of Electrical Energy and a Few Facts regarding CW Transmitters. Two views inside the 1BCG amateur station which transmitted across the Atlantic during the recent tests. General view of 1BCG, showing the station building, the masts and the antenna system."

"The First and Last, 18-Inch Naval Gun."

"Will the Direct Current Era Return?"

"The General Utility Alarm Clock—The Clock that lights the fire and starts the breakfast."

"The Heavens in April, 1922," by Prof. Henry Norris Russell, Ph.D.

Building Age and the Builders' Journal.

"School Planned for Future."

"Neat Cottage Design."

"Why the Roof Fell."

DO YOU KNOW THAT—

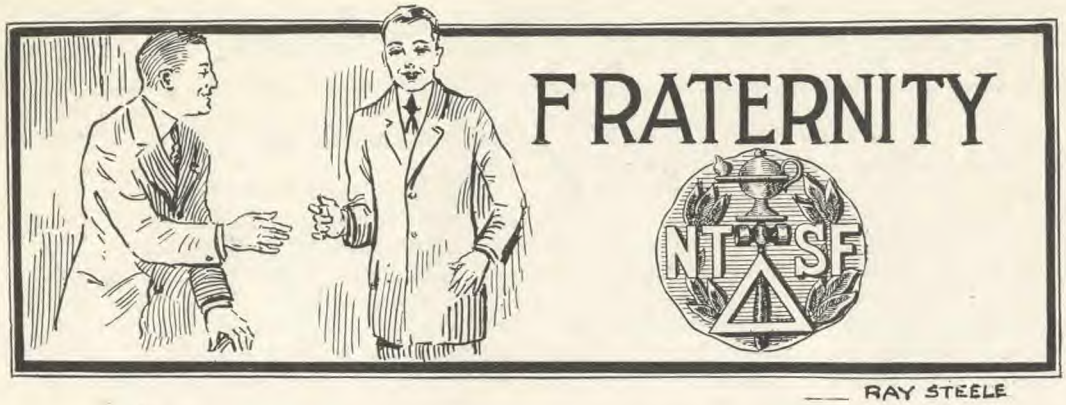
(*Continued from page* 18.)

run down too far before charging, as in a short time the plates will so corrode that the battery will no longer charge?

That only distilled water should be used to cover the plates in the storage battery?

More than half the troubles in a crystal set are due to a poor crystal? Try several pieces of crystal until a good piece is found, then hang on to it!

(*Continued on page* 33.)



SPRING DANCE

Spring is here in all its glory! If you don't believe it, you should have attended the Spring Dance given by the Frat on March 25th in the Laboratory Building.

The crowd was one of the largest of the season, and consisted of a representation of the Faculty, School (both day and evening), and Fraternity members, accompanied by their friends. Everywhere you looked, you observed a happy, smiling throng, and it appeared as if everyone was doing his best to uphold the good-natured spirit of comradeship which prevailed. The alluring airs of Brother Schutte's Premier Fraternity Orchestra would have made an old rheumatic bachelor hop around for joy, judging from the way the dancers kangarooed about the floor.

The feature of the evening was the Paul Jones, conducted by Brother Miele, during which bellhop hats, cry-baby baloons and streamers were distributed, causing a riot of color and general hilarity. A little novelty was added to this dance when Brother Jenkins pulled the switch during a wild scramble. It was noticed when the lights were again turned on that this was the only time Conductor Brother Miele did not have his choice of the girls.

Brother Rutan rendered several songs as the crowd danced, thus making "The Sheik" and "April Showers" more tuneful music to dance to.

The only gloom of the evening occurred when the band struck up "Home, Sweet Home." We never knew time could fly so rapidly. However, everyone went home satisfied and with a feeling that a better time could not be had.

The decorations gave one a real impression of spring, and the work of the committee conducting the affair was appreciated by all.

D. N. T.

OLD-TIMERS' NIGHT

How many Fraternity Brothers were out to welcome Dr. Colton's return to "Tech" on the eve of his 70th Birthday, March 29th? If you were not there you certainly did miss a good time. From the opening of the meeting until the close everyone was in the best of spirits, in which Dr. Colton was greatly welcomed.

After a prelude by the orchestra Brother Carl Hock was appointed toastmaster, and the ceremonies were on with a lively start. Dean Cullimore was the first to deliver an address reflecting upon the value of a technical education and how the past, present, and future work of Newark Technical School grew from Dr. Colton's firm foundation established thirty-five years ago.

Following a proper introduction by the toastmaster, Dr. Colton gave us one of the most interesting speeches ever heard at "Tech." The doctor's speech concerned the past accelerated growth and reputation of the Technical Institution. For the past thirty-five years, continued the doctor, the Newark Technical School has stood for nothing but the best in training men for a technical education.

Space does not permit us to record all the fine points delivered by Doctor Colton, but upon concluding his speech, his wish was to retain and uphold the name of N. T. S.

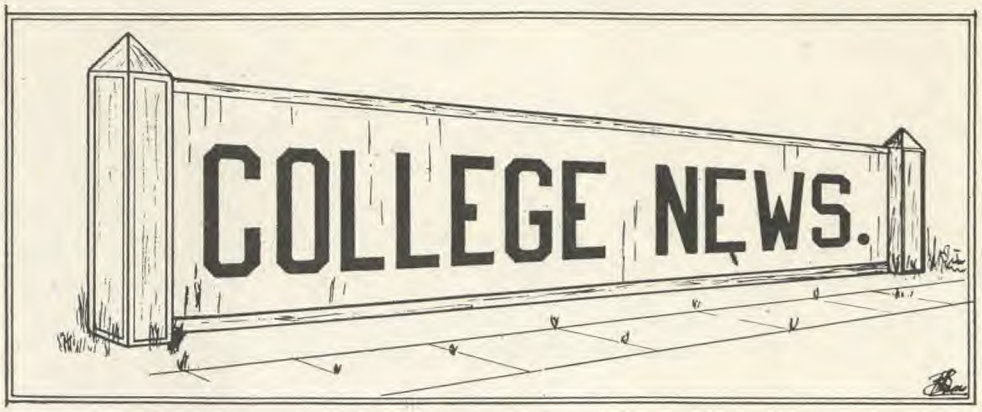
After exhausting ourselves in applauding for Dr. Colton, we were tendered a vocal selection, "Boy of Mine," by our favorite tenor, Brother Rutan.

As the loud clamor ceased Brother Hock called upon old timers to make brief speeches. The speeches were concentrated upon the advantage of a Technical Education and how each one felt indebted to the school. To define each speaker in detail would be impossible, but the speakers as recalled by the writer were as follows: Brothers Sheerer, Richards, Pete, Carpenter, Spence, Weir, Conroy, Gill, Rozzola and Monahan.

The next event on the program was Brother Rutan's vocal selections, "Rose in the Bud," and "That Old Irish Mother of Mine." As the applause calmed down Carpenter and Sheerer were called upon to lead the singing of Community Songs, in which every one took part.

After singing a few songs the "feed" was on,

(*Continued on page* 31.)



BASKETBALL

March 22nd saw the finale of the inter-league basketball schedule. The two games that were played, were very interesting, both from the football as well as the basketball standpoint. A surprise was accorded by all in the defeat of Hasking's team by Phelps' team. Hasking's team was outplayed from the initial whistle, the final score being 12-5.

Eitel's team emerged on the short end of an 11-8 tilt with Vanderhoff's team. The excellent guard work of Aurhammer and Parks were the features of this game. The shorts of Eitel and Eagle were also outstanding. A great deal of credit is given to Coach Guillou for the molding together of four teams which will form the nucleus for next year's varsity.

The final standing is as follows:

	W.	L.	Pct.
Hasking's	5	1	.834
Phelps's	4	2	.667
Eitel's	3	3	.500
Vandy's	1	5	.167

INSPECTION TOUR

On Saturday afternoon, March 18, a party of students from both the day and evening classes, ten in all, accompanied by Prof. Netschert, visited the Seaboard By-Products plant on the Hackensack. Upon arriving the party was split into two sections, and each was placed in charge of a guide who very capably explained the details of the process whereby coal is converted into coke and the various by-products, tar, benzol, etc.

An interesting feature of the place is a water gas plant which furnishes the gas to heat the coke ovens which are of the retort type. Perhaps the most fascinating sight in the plant is to see the red hot coke come tumbling out of the oven into a steel car which carries it under a water tower where it is quenched.

Of special interest to the chemical students is the laboratory where the composition of coal and the company's products are determined.

The trip was a big success and all who went on it derived considerable benefit. Thanks are certainly due to the company, to Prof. Netschert and to the Mechanical Engineering Society for making the trip possible.

L. J. P.

FRESHMAN CLASS

The Freshman Class of the College of Engineering of the Newark Technical School ran a stag theater party, Friday night, March 17th, 1922, at Proctor's Palace. Though the show in itself was not up to Proctor standards a jolly time was had by all. After the show the class dined at the Nankin Garden, and then broke up to do whatever they pleased.

O' APRIL '22

I hear you calling me. The Sophomore's of the College are going to run an April Dance, on Saturday evening, April 22nd, in the "gym." Keep that date open by all means. The dance is in charge of a committee of three capable young men: Ira Bergman, the President of the Class is Chairman, and he is assisted in his work by Robert E. Parks and A. W. Stevens. With such a committee in charge and the earnest co-operation of all the collegians a good showing is predicted.

HEARD IN CHEM. LAB.

"'The person who stole my thermometer had better return it. It will be of no use where he is going as it registers only 125 degrees.

CHEMISTRY

Davis—Don't boil that dye.

Taylor—You can't dye (die) cold; you've got to dye (die) hot.

DIRGE

There's a star in the window,
A can in the sink;
The water's synurized;
The brew's on the blink;
Fusel oil in the whiskey;
The brandy's no good;
The bourbon is moonshine;
The alcohol, wood;
The rickey is gin-less;
The wine—ah, c'est triste!
Is muddy and murky
And flavored with yeast
The star in the window
The can in the sink,
Don't answer the question
Of "What shall I drink?"

Russel—There is nothing dummer than youth.
Newitz—You must have been very youthful.

CAPITAL ADVICE

The pupil has no E Z life,
And if he would X L,
He must get all the A D can,
R E cannot do well.

He will become a C D man,
And oft be called A J,
Unless he gets what L P can
Obtain in N E way.

So, if he fondly hopes 2 B
Successful ere he die
In K C wants to stand with men
Who R A counted high.

Let him work hard and take A Q,
B E so very wise,
If every D D does is right,
He surely must R I's.

Let him keep B Z every day,
And C K task to do;
Or L C cannot hope 2 C
The N D has in view.

R. Stork says he doesn't know whether to marry a beautiful girl or a sensible one.

He needn't worry. A beautiful girl could do better and a sensible girl will know better.

Lindeman—When is a fowl's neck like a bell?
Sherrier—When it is (w)rung for dinner.

LAST ISSUE

Osterheld—What is an eel?

Schuler—An eel is a fish with his tail all the way up to his ears.

DOWN ON THE FARM

Reid—How's the pig?

Fischbeck—He is a great glutton.

Reid—How is that?

Fischbeck—Be jabbers, he drank two pails full of milk and when I put the little rascal in the pail he didn't half fill it.

"My friend," said Wegman, "have you sufficient confidence in me to lend me five dollars?"

"Oh, yes, I have the confidence, but I haven't got the five dollars."

HOOPER IS IN THE ICE BUSINESS

Hooper—Do you want any ice?

Lady—No the baker just left a cake.

She—Kindly return my lock of hair.

Robina—All right; do you want the dark lock or the one you gave me when you were a blonde?

Leidig—Why was the whale that swallowed Jonah like a milkman who has retired on independence?

Miller—Because he took a great profit out of the water.

O'Connell—Why does a chicken cross the street?

Jenkins—Oh, that's an old one don't pullet.

School News

PROF. HOWARD RESIGNS AS SUPERVISOR OF THE EVENING SCHOOL

It is with deep regret that we announce the resignation of Prof. David K. Howard, as Supervisor of the Evening School.

Under the heavy strain of the combined day and evening work, Prof. Howards' health has broken down and for that reason he has deemed it wise to devote the major portion of his time to the College instruction only. He will, however, retain his position as Head of the Chemical Department for both the College and the Evening School.

We have always found Prof. Howard to be a man of sterling character, an efficient supervisor, a cheerful advisor, an ally and our friend and we shall feel his loss at evening school very keenly. We hope he will shortly regain his full good health.

Mr. Ernest C. Bradford has been named as the successor of Prof. Howard, as Supervisor of the Evening School.

Mr. Bradford has been the co-ordinator for the College of Engineering work and, therefore, needs no formal introduction. Before joining our instructing staff, Mr. Bradford was Works Manager for the F. C. Mesa Company of Irvington, N. J.

We cordially welcome Mr. Bradford and pledge to him our support and co-operation.

'23's THEATRE PARTY

Another triumph staged by the well-known Class of '23. On Saturday evening, March 11th, 1922, the Class of 1923 gave a theatre party which perhaps surpassed any affair of its kind given in Newark Tech. A grand total of fifty-four persons attended. The evening started with a review of the performance then running at Proctor's and the consensus of opinion among the experienced theatre-goers of the party credited this performance with super-excellence. No doubt this excellence was the result of a special effort to please the theatre's special guests. However that may be, we all enjoyed the show exceedingly. After remaining to see the last act, a sure proof of the aforesaid super-excellence, we arose, fifty-four strong, and proceeded in military order to Achtel-Stetter's, the scene of the remaining festivities of the evening.

Having arrived at the restaurant, disposed of our wraps, and spent about twenty minutes in overcoming our natural shyness, we entered the supper room reserved for us where we found the gayly decorated tables arranged in the form of a horseshoe. The speed with which we arranged ourselves at the tables and attacked the beautifully served seven-course supper was indicative of good food, healthy appetites and good fellowship. The after-dinner speeches which followed were remarkable for being short, interesting and to the point. Speeches were made by President Reid, of '23 who related the plans, purposes and past achievements of '23, by President Williams, of '22, who related the valorous deeds of '22 and expressed his appreciation of the co-operation which '22 had had from '23, by Mr. Anthony Robina, who compared old Tech customs with those of more recent date and last, but not least, by Dean Cullimore, who struck the note of the evening when he recommended for '23's motto: "Here's to us, there's nobody like us."

After the preliminaries were settled, the Tech's popular musicians, "Eddie" Schutte and Herman Hesse, started some jazzy music which started so many feet going that the tables and carpets disappeared in a twinkling and dancing proceeded merrily.

Well, 'twas a fine evening: good show, good eats, good music, good dancers.

Here's to '23, there's nobody like us.

HELEN A. CLARKE.

CLASS OF 1924

On March 4th, the Class of 1924 enjoyed their first social event, a theatre party at the Rialto followed by a supper at Achtel-Stetter's.

The affair was a hugh success and was attended by twenty-four members, all in good spirits. The only thing R. Stork had on his hip was a pair of binoculars and needless to say they did not remain there long after the curtain was raised. It took two good men to hold down Roy Anderson when one of the actors knocked Roy's beloved home town, Elizabeth.

After the show we went to supper at Achtel-Stetter's and then "Our own fun" began. Many good jokes and stories were told by the different members present. President Geo. Miller said a few words regarding the purpose of our organization and also spoke of holding another stag party in the near future. Secretary Ted Newitz was the next one to speak and his address was followed by that of Treasurer Ralph Stork. Al. Leidig presented an excellent class yell which met with the approval of all and was accepted. After Mr. Leidig had repeated the yell a few times, all the boys chimed in and it was Some Yell. Mr. Leidig also spoke of a class song which he hopes to have completed soon.

Wm. Schuler and Stan. Harling entertained the boys in wonderful style by rendering some fine piano selections. Toward the close of a wonderful

(*Continued on page* 35.)

FLAPPERISMS

"Wool stockings covers a multitude of shins."
"A girl is known by the engagement ring she keeps."
"A girl's heart is naturally light when she strikes a 'match.'"

WHEN MEN WORE ARMOR PLATES

Burnett—Oh, Estelle, wouldn't you like to have been made love to by an old-time knight?

His—Nix on that, kiddo—sitting on an iron knee never appealed to me.

CURRENT TOPICS

Rigenstreich, 1st E.E.—Wire-insulate?

Vaderlip, 2nd E.E.—Couldn't get ohm sooner.

Reigie—Watt?

Van—I can guess switch girl. Mazda?

Reigie—See here, fuse go to get personal I'll socket to you.

Somewhat burned out they both left in search of light refreshments.

NOT BY THE SKIRT

Bauer—I saw a girl on the street to-day in a bathing suit.

Phelps—How could you tell it was a bathing suit?

A CHANGE OF TENSES

I'd rather be a "could-be"
If I am not an "are,"
For a "could-be" is a "may-be"
With a chance of touching par.
I'd rather be a "has-been"
Though a "might-have-been" by far,
For a "might-have-been" has never been
And a "has-been" was an "are" ("Bergie")

A boy sat on the moon-lit deck,
His head was in a whirl;
His eyes and mouth were full of hair,
And his arms were full of girl.

A WORD FROM THE WISE

Because we are not witty,
Because we have few jokes,
Because we print few stories,
That please you funny folks,
You sneer and groan and grumble,
And fling us on the shelf;
Gentle reader, why don't you
Write a bit yourself?

"IRA."

OUR PROFS?

"Love-making is often slow. Many a college professor wins his wife by degrees."

"Guess I'll take a drink," said the sailor as he fell overboard.

PHI BETE

Miss Dodman—The only men I kiss are my brothers.

Collard—What "frat" do you belong to?

Allen (to chaperone)—Would you care to dance?

Chaperone—Why, surely—

Allen—Wait a moment; I'll see if I can scare up somebody.

Mary doesn't rouge her lips,
Neither does she paint;
Is she a hit among men?
You know darn well she ain't.

Cobb—If I lost my knee, where would I go to get another?

Jillard—Dunno.

Cobb—I'd go to Africa, because that's where negroes.

Nile—Are you in pain, George?

Bornjy—No, the pain is in me.

Federal Board News

VETERANS OF FOREIGN WARS

Have you done your bit for Abraham Lincoln Post? Have you given as much to the Post as you have accepted from it? You can not answer these questions in the affirmative if you have merely paid your dues and occasionally attended a meeting. You owe the Post and the principles for which it stands something more than that. If you are content to wear the Cross of Malta and call yourself a member of the Veterans of Foreign Wars because of that alone, you are doing yourself and your fellow members a grave injustice.

There is a definite work for you to do. There is something you can give the Post which will increase your value to your fellow members and bring them closer to you. Give your membership in Lincoln Post a bit of real thought. Don't wait for the Post Commander to give you a job doing something. Go out among the ex-service men you know, whether in school or out, and do it on your own. The Post expects something more than mere due paying loyalty. If you are a Lincolnite at heart, you will want to be more than just a due paying member.

The following members were elected as delegates for the State Encampment which takes place April 8th and 9th at Trenton: William G. Millington, Maurice Keenberg, Alfred H. Mundy, F. J. Lynch and Russell Vincent. The alternates are Leo H. Mathews, Louis P. Meluso.

Great doings can be expected in the line of entertainment, for our entertainment committee under the guidance of Millington, is working very hard.

Bowling teams organized a few weeks ago are going strong. There are "some" good bowlers in the Post even though the Commander thinks otherwise. Who said, "Set the pins up in the gutter?"

The men who sat in boxes at the Broad during showing of "East is West," enjoyed the play immensely. Even Vincent had a good time.

Those of us who attended Connoly Post Smoker agree that without a Shamburgh and a Leo H. Mathews Smokers are nix.

The Degree Team, which was guided by Riley, has a good start, but Riley has other work to do and asked to be relieved. Shamburgh is now the boss of the team. Go to it, Shamburgh, and remember, "No Draw Blood."

Didja notice our stuff in the paper every week? Atta boy, Riley. Keep up the good work; you have only forty weeks to go.

The Commander is very glad to greet so many comrades at the meetings of Lincoln Post. The attendance has increased each meeting, and above all, the spirit of good-fellowship has been 100%. Your officers have been doing all in their power to spread good-fellowship, and the glad hand of Lincoln Post has been receiving favorable comment from the many visiting comrades. We can not make a record along any other line which will better prove us worthy of the name of Abraham Lincoln Post than the ever-growing spirit of friendliness.

FEDERAL BOARD WORK IN NEWARK TECHNICAL SCHOOL

By Robert Widdop.

The public is more or less acquainted with the work that the government, through the Veterans' Bureau, has been carrying on in this country in its effort to restore to his former earning capacity the ex-service man who, through the effects of service has been incapacitated. It knows, for instance, that the man has the choice of vocational training in any field, that he has his tuition and incidental school expenses paid, and that he has in addition an allowance for his personal unkeep.

Perhaps it does not know that the government has taken great care to err on the side of liberality to the ex-service man, if any error at all has occurred.

The Newark Technical School has enjoyed a unique position among the schools that have undertaken this rebuilding work. The progress of a man in this institution has been limited only by his own diligence and capacity. In the trade courses, the machine shop course, the drafting course, the electrical course, the instruction has been thorough. This fact is evidenced by the number of efficient mechanics that have left the school and found good positions.

The work among our fellow service men of foreign birth has been highly productive. To place them in remunerative positions, it is necessary to teach them the English language. This fact was early recognized and provision made for instruction in that branch.

There has been here, as elsewhere, a few men who were dissatisfied with the instruction and the instructors. It has been my observation that the majority of these have been the type who are habitually dissatisfied. Any statement derogatory to the instruction is a more or less well covered insinuation against the administration of the School and the Veterans' Bureau, both of which have shown a high regard for the men themselves and a deep interest in their progress.

A CORKER, EVEN IF IT IS HIS LEG

ABOUT THAT BONUS

When we ask about a bonus politicians simply laugh, and slackers who are legion smile to see us get the gaff; to our claims for readjustment Congress listens and is bored, with the HUN caged up forever no one fears a GERMAN horde.

Quick forgetters are the grafters, who with yellow, shrinking hearts, screamed their terror to the rafters when we left for foreign parts; every politician bellowed of his love for all the "boys" and his heart with kind words mellowed as we left amid the noise.

We were promised recognition of our work, and jobs galore if we sent FRITZ to perdition with a wallop on the jaw.

We went out and did our "duty" that's the word the grafters used; stood the bite of filthy cootie, and came home to be abused.

How they honored, praised and cheered us when we left at country's call; yet the other day they jeered us when we asked for a bonus small.

Looks as if we fought to harbor slackers, grafters and their ilk, profiteers and other robbers rotten spawn of Satan's milk.

Midst the shell strewn fields of FLANDERS, or upon the ocean's breast, no one thought us bold panhandlers, as we laid our mates at rest.

As I say, midst war's great sorrow, while around us comrades died, no one thought of a tomorrow, for we'd lost our land job stride.

Then when war's grim task was over and we crossed again the foam, were we told to live in clover by the ones we'd left at home? NO!

We found our old jobs taken by the slackers who had stayed, with their yellow hearts aquakin', when we left to stem the raid!

Almost did our land disown us, who have never known defeat, when we asked for a small bonus just to help us on our feet.

Nearly every other nation gave its men a grant of land, yet our country shows vexation when we ask for a helping hand.

Do they call this an incentive for BRAVE men to go and fight? DOES IT MAKE *US* MORE ATTENTIVE TO THE OTHER WAR IN SIGHT?

D. RAY VANDERVEER,
N. T. School.

A PAGE BY DONG

Heard during recess: "You gotta write good stuff or he ain't goin' to take it. He ain't going to stand for no more of that there junk.

Prof. Weisenbach met flapper Castelli, the pride of his section, in the Academic Building carrying a large bundle of FRATECHS.

"Don't they make you tired, Castelli?" he asked.

"Naw," answered Castelli, "I'm givin' 'em out; I don't have to read 'em."

Let him up, Sarge, lookit what you got his head in.

Miss Scott—My father's an engineer. He makes telephones.

Miss Stark—That's nothing. My pa's a commuter, and he makes two trains every day.

WHO IS THIS GUY, DONG?

I see by the Newark papers that a fresh guy, named Mitchell, kissed his girl right under her chaperon's nose. It would have been better, Mitchell, to have kissed her right under her own.

"Pop" Williams, of the Electrical Class, has grown a new crop of hair, due to the use of "Solder Paste."

Idakitis (Tom)—Will you give me five dollars for a week old man?

Binstock—Who is the weak old man?

Prof. Kymer has instructed his men that when figuring to wire a house, to estimate on wiring the house only, but not to charge for the building of the house.

Hello Prof. Kymer, hows the dog and Ninny? (Now ask me, "What Ninny.")

Hellman's friend "Lil" is disappointed because his two friends escort him home every afternoon after school and she is left standing alone on the corner.

"Slim" Meyers will answer all questions regarding back pay and checks. It will be unnecessary to go down town. If it's anything about the Veterans' Bureau—ask Slim.

Kiley (talking car)—Whenever we have a run-in with a cop, I let my wife do the talking.

Langzettel—Does that do any good?

Kiley—Not a bit, except to convince her she can't win every argument she gets into.

Eccles—Quick, gimme a round trip ticket.

Ticket Agent—Where to?

Eccles—Back here of course, where ja spose?

McCormack—Is it possible to confide a secret in you?

Van Der Veer—Certainly, I will be as silent as the grave.

McCormack—Well, then, I have pressing need for two bucks.

Van Der Veer—Worry not, my friend, it is as if I heard nothing.

St. Peter—You say you were an editor on the Newark Tech paper?

Triesch—Yes, St. Peter.

St. Peter—Step into the elevator please.

Triesch—How soon does it go up?

St. Peter—It doesn't go up; it goes down.

Larsen—Were you ever pinched for going too fast?

Meluso—No, but I've been slapped.

Zett—Say, wot're you followin' me like that for? Didn't you ever see the likes o' me before?

Guadagno—Yes, but I had to pay a quarter.

DeBellis—Does your father allow you to have a monkey in the house?

The Girl—No, but you may call between 7 and 9 as my father is always out at that time.

Mitchell—How do you like my picture of an Arabian donkey?

Vincent—Marvelous! You have put so much of yourself into it.

Prof. Cummings (Engineering Class)—What is a drydock?

Student—A physician who will not give out whiskey prescriptions.

Mr. St. George—Prost, where are your brains?

Prost—Outside.

Mr. St. George—Well, go out and see if you can find them.

Prost (to himself)—Hum. I really didn't know I had that many.

A FEW DON'TS ON BASEBALL

1. Don't work your arm sore.
2. Don't try and curve the ball too early in the spring.
3. Don't take off your sweatshirt because you feel warm.
4. Don't try and run too fast the first time in training.
5. Don't depend on your pitcher.
6. Don't try to kill the ball.
7. Don't fall asleep on the bases.
8. Don't fail to always get your signals when at bat.
9. Don't think because your team has the most runs that you can ease up.
10. Don't fight the ball.
11. Don't think you have a position on the team under your hat, as the next fellow may be a bit better.
12. Don't fail to ask questions on baseball.

C. R. WEISENBACH.

Lutz—Say, Keenberg, how did you like that cigar I gave you? If you smoke 1,000 of them and save the bands they give you a talking machine.

Keenberg—Huh, if I smoke 1,000 of them I wouldn't want a talking machine, I'd want a harp.

ENGINEERING AND MATHEMATICS

(*Continued from page 4.*)

lessened. In a word then we want to teach men to think straight and think quickly. To reason logically and quickly about the things of their profession.

The profession of engineering deals primarily with materials and men and with their relations, to the end that certain things be economically produced for the benefit of mankind. An engineer must therefore study and be able to understand and correlate those natural laws which underlie the behavior of men and materials under varying conditions.

The laws underlying the behavior of materials especially, are capable of mathematical statement and development, and mathematics, therefore, furnishes the best and simplest means of dealing with the workings of such laws. It should be remembered that mathematics as used by the engineer is only a sure and easy way of expressing common sense truths. A law may be stated in words as well as by formula, but the formula lends itself better to development and to change than does the verbal statement. Given a law expressed as a formula, we can work upon it more efficiently and transform it to meet our needs much more effectively by mathematical means than by any other means which we have at our disposal.

Every mathematical symbol and every mathematical process, as engineers use them, must have a real, a physical, a common sense basis. It must be simply a method or a way of dealing with physical things. To an engineer there is no abstract value. A common denominator must mean that you cannot add ducks and pigs and call them ducks, and the ratio of ds to dt must mean speed. It is a language, a method of attack, an efficient and concise method of handling physical things.

A mathematician, as distinguished from an engineer, is a man who glorifies the means above the end, such men do not make good engineers for the servant has become the master. Mathematics should be always the servant, and common sense the master, and the two must be in accord.

Very often a love for mathematics is cited as a reason for taking up the profession of engineering; the reason is far from sufficient. An engineer should be able to handle mathematics, if mathematics handles him, the case is different.

So much for the direct applicability of mathematics. There is another point having to do solely with the training of engineers. Training along any line cannot at the start exactly partake of the nature of the final contest. Punching bags, tackling dummies and such devices have a place and it is still considered good practice to teach "falling on the ball."

Mathematics closely correllated with actual problems and examples furnishes about the only way we have to properly train a man in the process of logical thought. We can tell him whether he is wrong or not, where he is wrong and why he is wrong, and that without undue argument. As a training in close, accurate thinking, mathematics will always prove of the greatest value.

Some psychologists claim that because a student is proficient in mathematics, that he will not necessarily reason clearly in other subjects, that is, that there is no "hold over" or "transfer of training." This may be true of men whose mathematical ability consists in simply a technical dexterity in the transformation of mathematical symbols. If a student, however, can clearly analyze a problem, develop it step by step, setting all down in a clear, concise, neat manner, and if the result is correct and properly expressed, it would seem that he has habits of mind which if brought to bear on actual problems would in some measure at least insure like treatment. Certainly mathematics does teach the value of painstaking care in the matter of detail which is so important to every engineer.

We hear much in engineering about the practical man and the theoretical man and in many cases we find that the distinction is made on the basis of mathematics. The practical man uses his brains while the theoretical man uses his mathematics and the results differ with the practical man proving his point. Certainly brains without mathematics are infinitely preferable to mathematics without brains but this does not in any sense prove

the brains plus mathematics will not be better. Many times engineers are possessed of both to their great advantage.

It almost goes without saying that judgment or what is sometimes called common sense, is the vital factor. There are time when solutions are possible without recourse to mathematics, but when mathematics would lighten labor and there are times when a mathematical solution, or an attempted one is sheer folly, and there are times when mathematics make possible solutions otherwise not to be arrived at. The engineer must use his judgment, the real engineer does use his judgment, but in order to judge, he must hear the story of the plaintiff as well as that of the defendant, he must know his mathematics.

ALUMNI

Editor of FRATECH:

Once more we can see another semester drawing to a close and undoubtedly all minds will welcome the pleasant summer months. The group of men leaving the institution on the closing day of the school year can be divided into three classes, each of which I will here make mention of.

First. There will be the men who step from the student ranks into the alumni ranks, otherwise known as a graduate.

Second. There will be the men who step away with the feeling that they are getting closer to the day when they will step into the alumni ranks.

Third. There will be the men who leave with a feeling that perhaps they may return in the fall to resume their studies and perhaps they may not return for reasons known only to themselves.

Graduates: The Alumni Association feels both honored and proud to have this privilege of extending to you our congratulations and we know you consider them as being very sincere. It is natural that the friendship created while attending school may be somewhat lessened due to the personal contact not being as frequent as in the past. We are looking forward that each and every one will do his utmost in maintaining to the highest degree that brotherly feeling which every classmate holds for each other. The means through which this feeling will be perpetuated is by joining the Alumni Association.

We now extend to you a warm and hearty welcome and are hopeful of placing your name upon the panels of the Association.

A few words for you "Undergrads." We trust your summer months will be joyful and may you return in the fall full of vigor, then nothing will keep you from reaching your goal, "GRADUATION."

To you who are uncertain as to returning, we trust that any plans you may make will mature for your welfare.

Sincerely and fraternally yours,

NEWARK TECHNICAL SCHOOL ALUMNI

THE MENHADEN AS A SOURCE OF FISH OIL AND FERTILIZER MATERIAL

(*Continued from page 6.*)

The expelled liquor is pumped over to the oil room into a series of special tanks, equipped with steam coils, where, by heating and gravity separation the oil is floated on the surface and eventually freed of its water content. Further treatment by boiling, settling and exposure to the sun's rays in glass covered shallow tanks, results in a high grade of fish oil. This oil is then pumped into a storage tank from which it is run into barrels or shipped in bulk in tank cars or tank steamers.

The solid material or scrap, discharged from the press, although firm and hard and apparently quite dry, still contains 45 to 50 per cent. of moisture and about 5 or 6 per cent. of oil. It may be treated in one of two ways: first, by mixing with a certain quantity of sulphuric acid to fix the ammonia and to dissolve the bones, or second, by artificial drying so as to remove the major portion of the water, which it carries, and thus prevent decomposition with consequent loss of the valuable ammonia content, as well as to reduce the weight for shipment, etc.

Acidulating of the pressed scrap is sometimes accomplished by spreading the material on a wooden platform and spraying it with sulphuric acid and then thoroughly mixing the treated mass by hand. More frequently, however, this mixing is performed by sprinkling the acid from an overhead, lead-lined tank onto a stream of the pressed scrap while being moved along and turned over in a large screw conveyor. The latter method saves much labor and produces a more uniformly acidulated product. About 90 lbs. of 50° Be sulphuric acid are combined with each ton of the pressed scrap. A short time after treatment with the acid, the bones dissolve and the mass becomes very homogeneous, changing from a dull gray to a rich brown color. The acid scrap, as it is called, is then conveyed to the storage shed for shipment as required.

Artificial drying of the pressed scrap is generally accomplished by passing the material through a direct heat rotary dryer, of the parallel-current type, where the wet scrap is showered in a revolving cylinder in direct contact with a rapidly moving stream of hot furnace gases until its moisture is reduced to approximately eight or ten per cent. When desiccated to this point, decomposition is prevented and the material can be kept without molding or without loss of ammonia and can readily be ground to a fine powder for incorporating with other fertilizer materials.

Should it be desired to convert the solid material into a fish meal for use as a poultry or hog food instead of into a fertilizer product, it is sometimes advisable to complete the final desiccation in a steam drier since the direct contact of the hot furnace gases, with the partially dried meal, may result in imparting a scorched odor and flavor to the product because of careless operation. This naturally reduces its value as a stock food although not necessarily effecting its value as a fertilizer.

The amount of the finished products of fish oil and dry scrap recovered per ton of raw menhaden is a variable quantity depending chiefly on the season of the year and the location where the fish are taken. Although the fish are very fat when found along the Maine Coast, there is a great decrease in the oil content as they move southward along the shores. Thus, for instance, menhaden taken off the coast of Maine in August yield approximately fifty gallons of oil per ton of green fish; from around the eastern end of Long Island in October, about forty gallons; when taken in the Chesapeake Bay in November, approximately thirty gallons; from off North Carolina in December, about twenty-five gallons; while those caught along the east coast of Florida in January yield only ten gallons of oil per ton of green fish. Although the above figures may be somewhat greater than the average for an entire season, they clearly indicate the rapid reduction of the oil in the fish body on their way southward.

There is also a considerable variation in the quantity of dry scrap produced because of the changing oil and water content of the fish body. Ordinarily, however, about 350 to 450 pounds of dried scrap result from each ton of green fish treated.

Mention has already been made of the fact that

the dry scrap is employed either as a fertilizer material or as an animal food. The oil itself is used extensively in the manufacture of soaps and lubricants, in currying or filling of leather, for tempering of steel, for screw-cutting, wire drawing and in cordage-making. Large quantities of the oil are also consumed in the manufacture of paints, where it can be satisfactorily employed up to about seventy per cent. in connection with linseed and other oils.

Enough has been said to show that the menhaden industry is an important one and that it supplies valuable products for use in agriculture as well as in many lines of manufacture. Depending, as it does, for its raw material on a natural resource from the sea, the industry is subject to many uncertainties and dangers.

It is true that the cost of the raw material itself is nothing, but the expense of securing it, the large sums invested in the fishing vessels, seines and other accessories, in docks and in the reduction plants with their extensive mechanical equipment, as well as the high cost of operation and maintenance, cause this industry to rank as a hazardous undertaking.

Fortunes have been made under favorable conditions in the industry in a comparatively short time, but many have likewise been lost very quickly through unfavorable circumstances over which those in charge had absolutely no control. Only the spirit of adventure and the prospects of large financial returns serve to keep the menhaden industry from extinction.

FRATERNITY

(*Continued from page 20.*)

and we can safely say there was no one present who left with an empty stomach.

Continuing with a few more songs we finally concluded with the presentation of a Fraternity Ring to Dr. Colton by President Pfeil.

In connection with Old Timers' Night held in honor of Dr. Colton, it is interesting to present below a testimonial of the regard with which Dr. Colton has always been held by his students and graduates:

APRIL, 1920
TO
CHARLES A. COLTON, M.E., D.Sc.,
DIRECTOR OF
NEWARK TECHNICAL SCHOOL
1885—1919

As a remembrance of many happy moments spent under his learned, kindly guidance, during his long, singularly useful and successful career, as Director of the Newark Technical School, a crowning educational achievement, the members of the Alumni Association, his pupils, in whose heart of hearts he is graven in indelible characters, present in grateful appreciation, this volume of their autographs, gathered from the four corners of the earth, to symbolize the respect and affection of the Alumni Association.

PHILIP C. WALSH, JR.,
Class of 1900.

TABULATION METHODS FOR RATIOS

(*Continued from page* 8.)

Example 5. A sample of commercial sulphuric acid was assayed as follows: Having some solutions approximately .2N NaOH and .5N HCl, they were titrated against each other and against Na_2CO_3. To titrate the sample, some of it was weighed into a beaker, slightly less than its equivalent of Na_2CO_3 was weighed into it, the CO_2 boiled out, and the excess acid titrated with the NaOH solution. After titrating a precipitate was found, showing that the bases in it were originally combined with the acid, making it necessary to deduct their acid equivalents from the titration figure in order to show the free acid. All the data were referred to normal solution and the algebraic sum calculated to H_2SO_4, from which the percentage was found. As a check, the calculations were made to H_2SO_4 direct.

NOTE: Any problem in which there are no additions may be solved by logarithms as follows: Locate all the rectangles that will be necessary for the solution. Take the first rectangle, set down the logarithms of the complete pair of diagonals in the plus column, and the odd corner in the minus column. Then take the corner which would be filled by this, mark another rectangle, set the opposite corner in the plus column and its horizontal or vertical mate in the minus column, and so on until the last corner is reached, the logarithm of which is the sum of the plus column minus the sum of the minus column.

CC NaOH	CC HCl	Grams Na_2CO_3	CC Normal	Grams of Sample	Grams of H_2SO_4	Grams of Fe_2O_3	Grams of ZnO
(89.55)	36.70	1.0013	(18.892)				
24.40	10.00						
4.7402	1.9427	".00530025	1"		.049043"	.0266"	.0407"
(1			.2110) .2110		.010348		
	(1		.5148) .5148				
13.20		4.0507	(+ 2.785) (+76.425) (— .241) (— .074)	5.1175	+ .1366 +3.7481 — .0118 — .0036	.0064	.0030
			(78.895)	100	(3.8692) 75.61=%		

VULCANIZATION OF RUBBER

(*Continued from page* 8.)

manufacture of thousands of articles used daily by civilized man.

Vulcanization consists merely of mixing sulphur intimately with the raw gum and then subjecting the mixture to the action of heat. Perhaps it is interesting to relate how the action of sulphur on rubber was discovered which, we are told, was quite by accident. The inventor while stirring a mixture of sulphur and rubber splashed some of it upon a hot stove. He immediately noticed that a marked change had taken place. This led to subsequent tests and further exhaustive experiments and investigations in perfecting the process and calculating the amount of heat required to produce the results extended over several years.

Vulcanization, commonly called the "cure," increases the rubber elasticity and durability. Properly vulcanized rubber is not affected appreciably by either ordinary heat or cold. Every article made of rubber has to be vulcanized; a perfect, permanent union of one piece with another is impossible without it. This process is, therefore, the foundation of the rubber manufacturing industry. Comparatively simple and inexpensive methods of vulcanizing, some without the application of heat, have been worked out in recent years. Some of these give good results so far as manufacturing light, thin rubber goods, but in the manufacturing of auto tires and other heavy rubber merchandise, nothing equal to Goodyear's process is known.

In the tire factory the carcass or body is first built up of sulphur-impregnated rubber, gum and cotton fibre or cord on a steel core. It is then forced in a steel mold, weighing from five hundred to six thousand pounds. It next goes through the vulcanizing tank which ordinarily holds about a dozen tires. The cover of the tank is screwed down tightly and live steam is turned on. For twenty minutes the temperature inside the tank is gradually increased until it reaches 206 degrees. The flow of steam is then carefully regulated to maintain the temperature at this point. This temperature is held for about two hours, the tires are allowed to cool and are then stripped from their cores.

Once vulcanized a tire cannot be changed. If

there are any defects due to accident or negligence they cannot be remedied, because rubber cannot be "unvulcanized" nor can it be subjected to further curing without cooking the life out of it, rendering it well-nigh worthless. Tires, having only minor defects, go on the market at reduced prices as seconds. Those with serious defects are junked. As the labor and material costs that enter into the making of a tire are considerable, the manufacturer cannot afford to sell many seconds or to discarded many defective tires. To keep this spoilage as low as possible, a system of the most rigid supervision and inspection is maintained throughout the process. The vulcanization is watched with particular care because it is here that the most disastrous and expensive mistakes can be made. For instance, a drop of moisture anywhere in the fibre or rubber will be converted into steam when the heat is turned on and the steam will produce a bubble that may ruin the tire. Just the proper degree of heat must be maintained for a certain length of time and no longer in order that the rubber may be cured exactly right.

The heat in the vulcanization tank causes the rubber and sulphur to fuse together into an inseparable mass in which the fibre is held together. When a tire goes in it consists of numerous small pieces and patches of rubber or fibre, but when it comes out all have been fused and welded into a single piece. No less than thirty-nine pieces are used in making an ordinary rubber boot, all being laid and molded over a form. After vulcanization, however, the boot is a perfect inseparable unit.

DO YOU KNOW THAT—

(*Continued from page* 19.)

All connections should be soldered for best results?

That in a great many radio telephone receivers the capacity of the windings is greater than the inductance?

It is this looking into details that produces the success of a receiving set?

The amateurs who have those wonderful sets that work so much better than anybody else's will be found to be those who have had the patience to go into every last detail?

Miss Bull—Were you mentioned in orders?
"Pat" Lynch (Shanty Irish)—Oh, yes!
Miss Bull—By whom?
"Pat" Lynch—By the Provost Marshal in Special Orders to the Old Man.

Sopreto: "All right, let go my arm and I'll go with you.

SAMPLING

(*Continued from page 9.*)

dred pounds is about the minimum that will make a dependable sample from a carload. For shiploads of coal, running five hundred tons or more, the Bureau of Mines recommends four thousand pounds as the minimum weight of sample.

The manner of removal of the sample is as varied as one can possibly imagine. For occasional sampling, it is perfectly satisfactory to remove the increment of the sample from each wheel-barrow or grab bucket with a shovel. Establishments, which handle large quantities of stock use mechanical devices, which remove the sample automatically. The Illinois Steel Company receives all shipments of ore, whether by boat or rail, in the crushing department, where the coarse crushing is done. The ore leaves the rolls and passes through a sampling machine, which removes one-sixth of the material. This sample then passes to another machine, where it is subjected to a number of cycles of crushing, sieving, and fractionating until there is obtained a sample weighing about five pounds, all of which passes through a forty-mesh screen. The discard from the machine is returned to the manufacturing stock. Facilities of this character eliminate the personal equation entirely and give a thoroughly reliable sample. Unfortunately there are very few concerns who have a volume of business sufficient to justify so elaborate an installation.

For hand work, the gross sample obtained as above is subjected to a repeated cutting-down process, with suitable crushing or grinding between steps. It is necessary to maintain such a relation between the size of the sample and the size of the largest piece, so that the law of averages will operate to keep the proportionate composition constant. Between each fractioning, the sample is very thoroughly mixed. The methods to be used for the division vary with the character of the material and the size of the sample. Let us follow the recommendation of the Bureau of Mines for the working up of a sample of coal. The weight of sample to be divided and the largest size of lump allowable in the sample before division, are respectively:—

1,000 pounds or more,	1 inch.
500	¾
250	½
125	⅜
60	¼
30	$\frac{3}{16}$

The gross sample is spread out on a smooth, hard surface and the lumps are crushed with a tamper. For this purpose, a half-inch boiler plate serves excellently. It should be at least eight feet square and should rest on a concrete foundation. The plate should be placed in position while the concrete is fresh and precautions must be taken to see that the plate is in contact with the cement

CLASS OF 1922

throughout its under surface. The sample, having been crushed to one inch or less, is made up into a cone. This is then worked over into a long pile. The worker begins at one end and divides the pile into a conical pile and a rejected pile by putting alternate shovelsful, first in one pile and then the other. He works constantly at the receding end of the long pile. The conical pile is then worked over and all the pieces larger than ¾ of an inch are crushed. The division is again repeated and a sample of 250 pounds is obtained, which is crushed again to break up all pieces larger than ½ of an inch. This pile is worked up into a cone and after careful mixture, is divided with the shovel into quarters, using care to make the slicing as clean as possible. The opposite quarters are removed and the remaining quarters are again mixed, crushed, and quartered as before, until a sample of about ten pounds is obtained. It is usual to grind this sample to about 60-mesh. This is then carefully divided and sealed up in jars, with the proper duplicate labels. One sample goes to the laboratory and the other is held by the sampling department, for use in the event that the laboratory sample becomes lost or damaged, or more material is desired. In some plants, especially those purchasing valuable ores, the final sample is prepared in triplicate, one going to the buyer, one to the seller, and one to the umpire.

It is now clear why the sample for moisture in

the material must be handled separately. The working of the sample might easily change the moisture content to so great an extent that any data based upon it would not be reliable. The analytical results from the dry sample are converted to the wet basis by multiplying each item by 100—% Water.

100

For example, the analyst reports 4% moisture and 15% ash, the latter on the dry basis. To convert to wet basis: $\frac{15 \times (100-4}{100}$ equals 14.4% on the wet basis.

SCHOOL NEWS

(*Continued from page 23.*)

evening that had been greatly enjoyed by everyone, the use of lung power was not in the least restrained. The singing of songs from "Old Black Joe" to the "Sheik" were indulged in.

In the wee hours of the morning this party broke up and long will the memory of this wonderful evening dwell in the noble domes of all present.

R. E. S.

JOTS FROM '24's THEATRE PARTY

Ralph Stork says binoculars help one's vision very appreciably. Geo. Miller believes he had them glued to his eyes, 'cause George was pleading for one, little, lone look all evening, but was disappointed. All the boys who wore their own windshields, were seen to take them off quite often to shine them up, thus enabling them to get a more distinct and positive look at the feminine beauties who so gracefully betook themselves to show their wares to a most interested audience. Cliff Russel's attention was very undivided. The only time he was seen not looking ahead was when the "Almonds" were passed around. "Kisses" says "all of the beauties threw kisses exactly in our midst." We wonder if any of the boys were really fortunate in getting one of those airline kisses.

With a good meal waiting at Achtel-Stetters to be eaten after the show, all the boys slipped on their overcoats and made way very hurriedly. Say, that was some feed. All through it Harling never shut his mouth, some feeder. Anderson quotes: "I won't be last over the fence next time." Wright says, "he's wright there when it comes to eating." Say Walsh, did you get that laugh in the navy? Newitz must have used Calculus to part that new haircomb of his. Boys, just ask Odenthal to sing that little ditty of his. Say, fellows, don't forget to practice that yell of ours—see Al Leidig, if you don't remember it.

AT FRAT MEETING

Pfeil—Brothers, please be quiet I can't hear myself think.

THE EPSILON MU PHI ELECTRICAL SOCIETY

On Saturday, March 4, at the school, members of the day and night classes who are interested in electricity organized the (E. M. F.) Epsilon Mu Phi Electrical Society. The purpose of this organization is three-fold—first, to hold meetings each month and to have speakers on various topics give addresses; second, to bring the day and night students into closer contact; third, to finally gain recognition from the American Society of Electrical Engineers and establish a student branch here. Officers for the present year were elected. These men are: Mr. Waller, Pres.; Mr. Perry, Vice-President; Mr. Cobb, Secretary; Mr. Furey, Treasurer.

At this meeting the members heard a very fine talk on the "Automatic Telephone," delivered by Mr. A. E. Petrie, who is the Eastern Power Engineer of the Western Electric Company. The subject was a timely one and was presented in an instructive as well as a very interesting manner. After the talk cocoa and doughnuts were served, and "a good time was had by all."

The members feel that the club is going to be a big thing, and as such wish that all who are interested would come to the next meeting and see what is being done in the way of increasing our contact with the industry. If you have some idea that you think will benefit the club—hunt up your representative and spring it—what the society needs now is a big membership of wide awake fellows. Will you be one?

Zieschang—No, it's not an optical illusion, I didn't see any mirrors there.

MORE TRUTH THAN POETRY

Mr. Boland—What cents (sense) have you got?
Eberhardt—Very little.

The Class of '23, would like to know if the fellow students think they wear black ties with red stripes or red ties with black stripes?

NOTICE

Three graves cancelled at Fairmount Cemetery. Robina has decided to let 3 members of FRATECH Staff live till next year, although he wore white socks at Frat Dance.

Goldfish—I'm quite a world traveller.
Frog—How's that?
Goldfish—Well, you see, I use to live in a fish globe and so became a globe trotter.

What is nothing?
A brimless hat without a crown.

How came the sandwiches there?
The tribe of Ham was bred there and mustered.

John Landers after hearing a wonderful musician, concluded to take lessons from him, and inquired of his terms.

The answer was six dollars for the first month and three dollars for the second.

Landers—All right, professor, I'll come the second month.

Wilson—Leather is much cheaper, Geo.
Freund—Yes, but I haven't noticed any drop in the price of restaurant steak.

Dear Ted:—I am sending you my old coat by parcel-post, I have cut off the buttons to make it lighter. You will find them in the inside coat pocket. Yours, Ed. Then.

Freund—How many shirts can you get from a yard.
Wilson—It all depends upon whose yard I go into.

J. Cotter—How can I make my hair grow longer?
Landers—Read hair-raising stories.

Willie Slip—What is your new brother's name, Jones?
Jones—I don't know yet. We can't understand a word he says.

BOTH RIGHT

Eccles—Shay, is that a Rolls Roysh over there?
Horton—Nope, thash a groshery wagon.
Eccles—Then your not looking in the same plash?
Horton—Hic; neither are you.

Hefty—What did Adam first set in the garden of Eden?
Dunn—His foot.

Miss Tunstead—Have you any invisible hair nets?
Storekeeper—Yes.
Miss Tunstead—Please let me see one.

Lawlor—Which end of this car do I get out?
Conductor—Please yourself, sir; we stop at both ends.

Jenkins—This is a very healthy town. My father died here at eighty-five and my grandfather at a hundred and forty.
Littman—A hundred and forty?
Jenkins—Yes; High Street.

"Is this engaged?" asked Chris Roehrich, of a bright looking maiden on the train the other day.
"No, sir," she modestly replied, "but I am."

Odenthal—Why is an elephant like a tomato can?
Zwingel—Because an elephant can eat peanuts as well as a tomato can.

OHM. I.

Hartkoff—Hey, Slim, wire they conducting those two Poles to the electric chair?
Romana—Because they were burning juice at the Battery, and a cop-er two doing their cores discovered and captured them. At the terminal the cops gave up their charges, and after placing the juice burners safely in cells, they were discharged and sent ohm.

Old lady—Oh, conductor, please stop the train, I dropped my wig out of the window.
Conductor—Never mind, madam; there is a switch just this side of the next station.

Mrs. Newlywed (as she paid the milkman)—I do hope you keep your cows in a pasture.
"Certainly," replied the milkman.
Mrs. Newlywed—I'm so glad; as I've been told that pasteurized milk is much the best.

Prof. Koshkarian—I wish some of you fellows wouldn't scratch your heads. They give a hollow sound.

FLEE FLEA, KENNIE

First Flea in Post Toastie Box—What's your hurry?

Second Flea—Don't you see that sign, "tear along this edge?"

WHO'D THOUGHT IT?

"Oh, deah," said the sweet young thing, "so this is Oxford! Well, I've been wearing them for a long time and I've always been anxious to know where they came from."

CAT!

Su—I dread to think of my thirtieth birthday.
Mu—Why; what happened?—*Cornell Widow.*

Prof. Peet (to freshman in Physics)—I don't like the way the book explains this. I will make it so simple that even you can understand it.

Mannheim—I want my hair cut.
Barber—Any special way?
Mannheim—Yes, off.

"Silence is a virtue."—Robt. E. Parks.

"JES LIKE IT"

Perrine—What do you think is the cause of so many unhappy marriages?

"Patt"—Too many people are married before they get sense enough to stay single.

ZAT SO?

Damitz—Santa Claus certainly was good to her.
Haskings—How's that?
Damitz—See what he put in her stockings.

Prof. Howard—Borman, if two parts of hydrogen unite with one part of oxygen to form water, why doesn't water burn?

Borman—That's easy, because it's wet.

Eitel says:—Man represents more animals than anything else. Reasons: Calves on his legs; frogs in his throat; swallow in his neck; hair on his chest and bull, right on the end of his tongue.

Bollman—How high should a clothes pole be?
Van—I don't know.
Bollman—Three feet.
Van—Why?
Bollman—Well, it's a yard stick, isn't it?

Mebius—Are you the chump who wrote about the dance Friday?

Rizzolo—Yes.

Mebius—Well, look at this, "Among the prettiest girls in the room was "Parks." Don't you know that Parks is a young man?

Rizzolo—Sure, but that's where he was.

Gordon—My pal calls his hat a Pod because he keeps his bean in it.

Prof. DuBois—Construct a sentence with left and right in it.

Kenlan—Good girls are left and flappers are right in it.

A MATTER OF FORM

Borman (in a village notion store)—Whaddayar got in the shape of automobile tires.

Saleslady—Funeral wreaths, life preservers, and doughnuts.

POSSIBLY

Fogel (in drafting room)—Close that window; it's cold outside.

Schultz—Do you think it will be warmer outside if I close it?

DISTINGUISHED

Mosch—You say that man's a Ph.D.? He doesn't look very scholarly.

Widdop—Sure, hes a Ph.D. prohibition hooch distributor.

Eberhardt says that if man originated from monkey, the Prince of Wales must have originated from a fish.

They say that storks have a fondness for babies, but we think that R. Stork is more fond of chickens.

Coleman—Waiter, kindly remove this egg.

Waiter—What shall I do with it, sir?

Coleman—I think you had better wring its neck.

Cassidy—Why should free seats at church be abolished.

Charlton—Because they make people good for nothing.

Hesse—Do you see any change in me?

Bert—No. Why?

Hesse—I just swallowed a cent.

J. Wallace—Why isn't the FRATECH like prohibition?

Freund—Because the only dry thing in it is the ink.

Ziechang says it isn't what a man stands for, as much as what he falls for.

Rose—Why is a cow like a can of tomatoes?

Shuler—You've got me. Why?

Rose—Because neither one of them can ride a bicycle.

Frisch—What kind of an animal has no eyes, no nose, no mouth, and no limbs?

Simons—Hot dogs.

Prof. Kiley (after running his car a short distance, phoning)—Send assistance at once, I've turned turtle.

Voice (from other end)—My dear sir, this is a garage. What you want is an aquarium.

I wonder what kind of tobacco Mury uses when he gets behind the tree. Ivanhoe?

The Ed. fails to see the joke but it will get James J. Murry's name in print.

Our friend Joe's food emporium is still ruled by the Hot Dog and Finale Hoppers.

Thursday: Mury wanted to know what the price of hiring a taxicab in New York amounted to.

Friday Mury wanted to know what was good for chills and fever.

Prof. Weisenbach said, "Probably the price of the taxicab."

Larsen—We had quite a game up at the house last night.

Griffith—Poker?

Larsen—No, the landlady was going to lick Horton for not paying his board. I tried to checker, she jumped me, crowned him, and told us both to move.

Griffith—Did you do it?

Larsen—Chess.

Pierson—How did you catch that cold, Roy?

Anderson—I fell asleep on a park bench and forgot to close the gate.

DeMarzo—I'm a little backward about dancing.

Ziechang—Why don't you dance forward?

DeMarzo says that Henry Reid was the only good skate at the last dance, because he was the only fellow there that would dance with him.

IN ENGLISH

Instructor—Will some one please explain to Mr. Fehler what is meant by the word "sigh"?

King—A sigh is something that you do at two different times. When you're tired and when you're in love.

Kaposcinski (Looking at drawing)—Mr. Weisenbach what do C. U. mean after this man's name. Cornell University?

Mr. Weisenbach—No. Columbia University.

Kaposcinski (looking at school catalogue)—Mr. Weisebach, where is dot Coach University?

"How many work on that road detail, Sergeant?"

"About two-thirds of them, sir."

This school year drawing swiftly to a close has been one of marked brilliancy for the Newark Technical School Fraternity. From the Introduction Dance, held on October 8th—the very first week of school—down through the Hallowe'en Dance, the Thanksgiving Dance, Old Timers' Night, the Annual Reception and Dance and to the Spring Dance of March 25th, the events have been unusually successful.

Now we are preparing for the last, big social affair of the current year

THE 24th ANNUAL BANQUET

to be held on Thursday evening, May 18th. You will enjoy the excellency of the cuisine, the eloquence of the speakers, the music of our own Orchestra and the pleasure of meeting your fellow Fraters.

Mark this date on your calendar now. The restaurant at which the banquet will be held is Achtel-Stetter's and the tickets are $2.00.

THE COMMITTEE.

NEWARK TECHNICAL SCHOOL FRATERNITY