WITH THE JUNIOR E. E's.

It is not until we reach the Junior class that our course differs in any way from other engineering courses In this year the E. E's. start taking Electrical Measurements. The most noticeable feature of this work is the use of the galvanometer. All kinds of galvanometers are used and in all sorts of ways. The measurement of resistance of ordinary values is accomplished by means of the Wheatstone Bridge or by some drop of potential method, but even here the galvanometer is the indicator which tells us when the proper adjustments are made.

Strickly speaking the galvanometer is a device for the measurement of electrical currents. Some galvanometers may be used to measure currents as small as one-ten thousandth of an ampere or as large as a thousand amperes. It is this extreme sentitiveness that makes the galvanometer such a valuable instrument in electrical work. These measurements bring out many interesting features that otherwise would not be known except for the work being done here and elsewhere.

For example, if a substance has a certain resistance at one temperature it will not have the same resistance at another temperature. But understand, the resistance does not change in the same way, for example, an incandescent lamp has a lower resistance as the temperature increases; but a copper or steel wire has a higher resistance as the temperature incenses.

Another interesting feature is the plating of metals by means of the electric current and the relation that exists between the amount of metal deposited and the current flowing. An ampere flowing for one second will deposit .001118 gramme of silver from a solution of silver nitrate, while the same current deposits only .000329 gramme of copper from a copper solution in the same time. This furnishes a very good check of the amount of current that flows through the circuit in a given time.

Another interesting piece of apparatus is the Standard Cell. The Junior laboratory is fortunate enough to have two types of the Standard Cell, each giving an electromotive force which is known down to one-one thousandth of a volt, and by means of which other electromotive forces can be standardized.

Every interesting experiment that some of the Junior E. E's. get to work at is the determination of Joule's equivalent, or the amount of heat generated in a given circuit by the passage of an electric current. This is accomplished by means of a piece of apparatus known as a Calorimeter. The current is measured with an ammeter and the rise in temperature of a known volume of water with a thermometer. Then knowing the relation that exists between these quantities, the heat generated is figured.

These experiments give us an insight into the work of the Senior year and the things we will be likely to meet in our every day work in after life, if we follow our chosen profession.

For this practice we are divided into groups of threes, and no two groups are at work on the same experiment at the same time. Records of the experiments are carefully written and preserved by the students preforming them for future use in advance work.

WITH A JUNIOR M. E.

When an M. E. student becomes a Junior he begins to realize and appreciate the usefulness of the practical work which he does in the shops. In practice work the Junior M. E's. do not work in groups except in such work as making engine tests, where grouping is necessary. In the shop each man has his piece of work to do and the doing of it concerns him and him only, each man being responsible for his own progress.

The first task to be done in the machine shop is clipping, filing and scraping a cast iron block. Each man as he receives his little two-inch cube of cast iron is inclined to think it is a "cinch," but after work actually begins the novelty soon wears off. The first evening or two is usually devoted mostly to learning how to temper and grind a cold chisel. When the block has been chipped to approximately one and one-half inches on a side, the cold chisel is discarded and the file taken up. It is filed to exact size and a try square must fit in all positions. To make the block fulfil these requirements it takes a week or two of time and a corresponding amount of patience. Next four adjacent edges are beveled and then comes the scraping. When one face has been scraped so as to be within one thousandth of an inch of a perfect surface the block is finished, and great is the joy of its maker.

As each man finishes the little cube, he is promoted to an engine lathe and then the real machine work begins. The first step here is to learn how to operate the machine while some simple exercises are being made. After sufficient time has been allowed for the student to become familiar with the operation of the machine and the setting of the tool, the exercises become sufficiently difficult to require a good deal of care and skill. In the thread-cutting exercise, gray matter counts for a good deal.

The lathe work, especially the thread-cutting, is very interesting. It is necessary to get the correct arrangement of gears in order to give the thread the desired lead, to do this the machine must be thoroughly understood by the operator. Care must be taken when cutting threads on cast iron, as it is very brittle. If too deep cuts are taken, a part of the thread will invariably be broken off.

After finishing all of the lathe exercises the student goes to the planer, then to the shaper, and finally to the milling machine. Finally only a few of the luckiest, however, get beyond the lathe before their senior year.

WITH THE C. E.'S

After some preliminary work is accomplished to familiarize the students with the methods employed in railroad construction, we begin constructing a railroad. For this work we are in squads of four or five. The first thing to be done when the construction of a railroad between two defined points is decided upon, is to run a preliminary, or trial line in order to obtain the best route that will involve the least cost, and at the same time taking into consideration the shortest distance.

In our junior C. E. practice we are required to run such a road. Only our route is chosen by the instructor, and we are required to first run the preliminary; next we change the original line a little, and put in several curves, usually two, which must comply with the requirements that "curves over seven degrees must be put in with fifty foot chords, while those of less than than seven degrees may be put in with hundred foot chords." Both of these lines are run with a transit, and are about 2500 feet long.

AT PRACTICE WITH THE JUNIORS.

The purpose of this article is to be interesting and instructive to any one into whose hands it may go and to give the students of any department information concerning the practice in the other departments. For example—to let a "bughunter" know what a mechanical engineering junior is doing while said "bughunter" is catching bugs, or carving on dead "live stock," and to let an electrical engineering junior know what textile juniors are doing while the E. E. is measuring electro motive "foce."

The nest thing to do is to run a line of levels over the choses route, taking readings on every hundred-yard stake where the slope is uniform, and if on varied ground, readings are taken where necessary to get the general change of slope. Reference points—stakes set at a given distance and bearing, from the center of the track—so the original line may be located when necessary after the road has been constructed—are them set at intervals of several hundred feet.

A grade line is now decided upon, and slopes stakes are set which regulate the embankment to be thrown up or the excavation to be made. These stakes are set at about the same points where the readings were taken for the line of levels. Since this is more practical than theoretical, it can't be easily described.

The civil engineer's work is complete after he makes the necessary calculations and the way is clear for the contractor.

With Junior Students of Animal Husbandry.

Perhaps in no other line of work is a combination of theory and practical experience more necessary to complete success than in the study of animal husbandry. When taken in detail it is indeed a broad subject. Being fully cognizant of this fact the department has made a liberal allowance of several hours per week of time to be put in by the student in actually searching out the facts for himself so that they remain indelibly stamped upon his mind.

In the first years of study the foundation is laid for deeper study by making close observations upon the outward appearance of animals, and the student gradually gets an insight into the forces which tend to produce certain effects such as differences of type and conformation conducive to the development of highest specimens of beef and dairy cattle, bacon and lard hogs, light harness and heavy draft horses, etc.

By the time the junior class is reached the student is prepared to enter in detail the study of the possible control of the internal and hereditary forces, and the effects of selection and environment which lead to the development of the desired characteristics. These vantage points are advanced upon from three positions—that of breeder, feeder, and veterinarian.

From the standpoint of the breeder practice is had in the tracing of pedigrees and the comparison of the combinations of blood lines in different pedigrees.

From standpoint of the feeder balanced rations, with comparative values of different food stuffs is studied, taking into consideration the fertilizing value of indigestible portions, and this is weighed in the balance with actual experiments in the feeding of different classes and types of animals. By actual experiments note may be made of the palatability and physical effects of certain foods. This is important, for no matter how perfect a ration is from theory, if the animal's appetite does not call for it your work is in vain.

In the veterinary department the bones, muscles, digestive, circulatory and nervous systems are studied systematically and in detail by the careful dissection of one or more animals each week. In this practice the students' work in groups of three, and each group works on a definite part until each group has studied the whole body. Following this is a study of the causes, symptoms, results and treatment of contagious and non-contagious diseases of animals.

Taken all in all, the course is intended not only to equip a man for success himself, but also to help him to be able to instruct others and thereby be made a useful citizen wherever he goes. "Si."