Fall 11-1907

Volume 17 - Issue 2 - November, 1907

Rose Technic Staff
Rose-Hulman Institute of Technology

Vol. XVII NOVEMBER, 1907 No. 2

THE ROSE TECHNIC

VOL. XVII. TERRE HAUTE, IND., NOVEMBER, 1907. NO. 2

THE TECHNIC.

TERMS:

One Year, $1.00. Single Copy, 15 cents.

Issued Monthly at the Rose Polytechnic Institute.

Entered at the Post Office, Terre Haute, Indiana, as second-clas mail matter.

THE Junior class is to be complimented on their choice of a memorial. The new walk which bears the numerals of the '09 men possesses both qualities of utility and ornament which have characterized the memorials of recent years, it occupies a prominent but not obtrusive position on the Institute grounds, and is of such a nature that it should long withstand the ravages of time.

TWO events of an unusual nature which have occurred during the past month deserve more than a passing notice. The first was the agreement between the Sophomore and Freshman classes that there should be no interference in banquet affairs, the text of which is printed elsewhere in this issue. This action resulted from the suggestions of the Students' Council, and while it may be regretted to a certain extent, it is thought that its commendable features more than compensate for the loss of the memory of a banquet scrap. It is certain that a custom which leads to the arrest of students for obstructing the streets, for destruction of property or breach of the peace, must be wrong, in part at least, and it is the wrong part of this custom which it was desired to do away with.

The second event was the action of the faculty in disbanding the football team. This action was taken a few days after the football game with Vanderbilt University, at which game Douthett, who has acquired professional athletic standing from his connection with the Terre Haute baseball team during the summer, was played as a substitute for a few minutes in the last half of the game, with the knowledge and consent of the manager of the Vanderbilt team.

Under the rules adopted at the Indiana Faculty Athletic Conference held in October, 1906, published in THE TECHNIC for November, 1906, it is held that the team by the playing of Douthett became a semi-professionable team, which cannot be allowed to take part in college athletics. The rule violated reads as follows:

RULE 2. No student shall participate in any intercollegate contest who has ever used, or is using his knowledge of athletics or his athletic skill for gain. * * *

While the disbanding of the team seemed like an extreme action, it was considered that any of the lesser actions proposed would be looked upon as an effort to condone the violation of the rules, or an attempt to evade the spirit of them for the sake of such financial benefit as might be had from the completion of the schedule. There may be room for a difference of opinion here, but it is to be remembered as an axiom that in a question of right or wrong it is always expedient to do the right, regardless of precedent, and that it is better to be so straight as to bend backward than to be under suspicion of a ready willingness to stoop to conquer.

The whole episode is to be regretted, but we believe that under the present action, the good name of Rose will be left free from all taint of suspicion, and that in the end the faculty's action will be shown to have been the best possible under the circumstances.

AUTOMATIC BLOCK SIGNALS.

By A. G. SHAVER, '97.

THE large number of railway accidents occurring during the last year has interested the public to the extent that the block signal system, as a means of preventing the collisions between trains and wrecks due to broken rails and defective or misplaced switches, is being given greater consideration than ever before.

The several methods of block signaling, depending upon the manner in which the signals are controlled and operated, are divided into three classes:

1st—The manual block system, in which the signals are manually operated by signalmen in accordance with information transmitted from one signalman to another.

2nd—The controlled manual block system, in which the signals are usually manually operated and so constructed and connected as to require the co-operation of the signalmen at both ends every time a train is admitted to the block.

3rd—The automatic block signal system, in which the signals are operated by any suitable power, as electricity or some compressed gas, and controlled electrically to indicate stop or proceed, depending upon the presence or absence of of a train in the block or some other condition affecting the safe movement of trains, as open switches or broken rails.

The manual block system appears to have been first used in this country in 1863 or 1864 on a line between Philadelphia, Pa., and Trenton, N. J., now a part of the Pennsylvania Railroad. This system is yet more largely used than any other, particularly on lines of light traffic and many single track railroads.

The controlled manual block system was introduced on the New York Central and Hudson River Railroad in 1882. It is now operated on more than 1,000 miles of railroad and its use is being extended.

Automatic block signals were invented and developed in America. Indeed, very few are yet in service in foreign countries. Records show that the first installation was made in 1871 near Boston on 16 miles of what is now a part of the Boston and Maine Railroad. Other installations followed at intervals, but it was not until 1879, when the track circuit was introduced and found practicable, that noticeable progress was made. Since that time there has been a steady growth in automatic block signaling till at the present time some 10,000 miles of railroad are so equipped.

The American Railway Association, of which nearly all the railroads in America are members, has explained some of the fundamental features and functions of block signaling in the following definitions:

BLOCK—A length of track of defined limits, the use of which by trains is controlled by block signals.

BLOCK SIGNAL—A fixed signal controlling the use of a block.

HOME BLOCK SIGNAL—A fixed signal at the entrance of a block to control trains in entering and using the said block.

DISTANT BLOCK SIGNAL—A fixed signal used in connection with a home block signal to regulate the approach thereto.

ADVANCE BLOCK SIGNAL—A fixed signal used in connection with a home block signal to subdivide the block in advance.

BLOCK SYSTEM — A series of consecutive blocks.

Though the signal devices installed five or six years ago were considered very satisfactory and those in service at the present time are giving good results, yet there has been and is now a gradual evolution in the design of apparatus always tending toward simplification and increased efficiency at less cost.

The very earliest forms of automatic signals were of the clock work and disc patterns, but, because of the greater visibility of the semaphore and because of its almost exclusive use for interlockings and the various manual signals, an automatic semaphore signal was soon developed and is now more largely used than any other.

All installations of automatic block signals have electro-magnetic controlling features and, with but few exceptions, electric track circuits.

It is only through the track circuit as a medium that absolute safety in block signaling may be attained.

The development of the art has been such that today an automatic block system signal system is considered very imperfect if a signal does not, by displaying its stop indication, denote the presence of a train, a broken rail or an open switch in the block. The track circuit through which this is accomplished is very simple. A section of track is fixed upon for the circuit ; an isolated joint is placed in each rail at each end of the section; all the ordinary rail joints coming within the section are bonded with two No. 8 B. W. G. E. B. B. galvanized iron wires ; a battery is connected at one end of the section and the electro-magnet of a relay at the other end. Thus a complete circuit is established, the rails serving as conductors to connect the battery to the electro-magnet. Fig. 1 illustrates this.

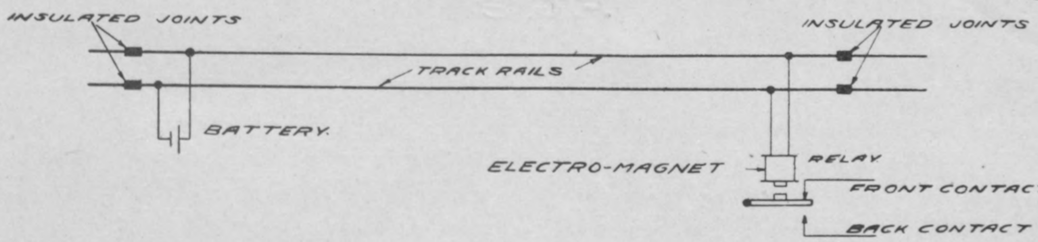


FIG. I.

Track circuit sections may vary in length up to six and seven thousand feet, depending upon track and climatic conditions. These lengths are extreme and exceptional, however. Under ordinary track conditions with good drainage, untreated cross-ties and good gravel ballast free from rail contact, it is considered good practice to make them twenty-five hundred to three thousand feet long.

The insulated joints are similar in many respects to ordinary rail joints with the exception that an insulating material, usually hard fibre, is applied in such a way that the two rails which are connected do not come into electrical contact.

The track battery ordinarily consists of two gravity cells connected in parallel, though in some installations a storage battery is being used with as good or better results.

The electrical resistance of the track is very low and with good bonding never more than .25 ohm per 1,000 feet of track, which is about the maximum in cold weather with all the rail joints open.

The resistance of the track relay electro-magnet is usually four ohms, but in some cases, with well insulated track and short sections, a resistance of nine ohms is used.

The track relay is equipped with contacts which, when the electro-magnet is energized or de-energized, make or break auxiliary circuits controlling the signals. Normally it is energized, but when a train enters the track circuit, the electrical resistance of the contact between the wheels and the rails is so small that the electro-magnet is practically shunted and the armature falls by gravity, thus operating the signal circuits.

High speeds and heavy trains require that there should be a home and distant signal for every block. The length of block is dependent primarily upon the density of traffic. Where the blocks are one and one-half miles or less in length, it is common practice to mount the home and distant signal arms on one post, the distant arm on any one post ordinarily operating as the distant signal for the home arm on the next post in advance. But where the blocks are longer than one and one-half miles, to mount the distant and home arms on one post would bring the distant signal so far away from its home as to make its indication ineffective; therefore, in such cases the home and distant arms are mounted upon separate posts two to four thousand feet apart, the exact distance being dependent upon the space required in which to stop the fastest train should the distant signal indicate caution and the home signal stop.

indicating that home signal 5 is at stop, and must therefore proceed prepared to stop at signal 5. If signals are equally spaced and this latter train always keeps the same distance behind the train ahead, it will run under caution signals all the way. It will be noted that the trains in blocks 8 and 2 are spaced with two blocks between them and each is running under both clear distant and home signals.

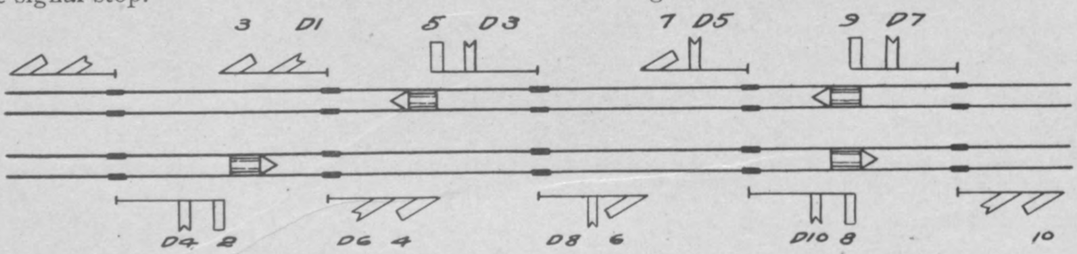


FIG. 2

Many railroads now use as night signal indications, red for stop, yellow for caution and green for clear or proceed. When a home semaphore signal indicates stop, its arm is in a horizontal position and in addition at night a red light is displayed. When either a home or distant semaphore signal indicates clear, proceed, its arm is inclined downward, usually 60°, and in addition at night a green light is displayed.

Fig. 3 illustrates an arrangement of semaphore automatic block signals on double track with the home and distant arms on separate posts. It is in effect the same as Fig. 2 but with longer blocks.

There are two general methods of operating automatic block signals known as "normally clear" and "normally danger." Each has its advantages, each is largely used and each has its advocates among the principal signal companies.

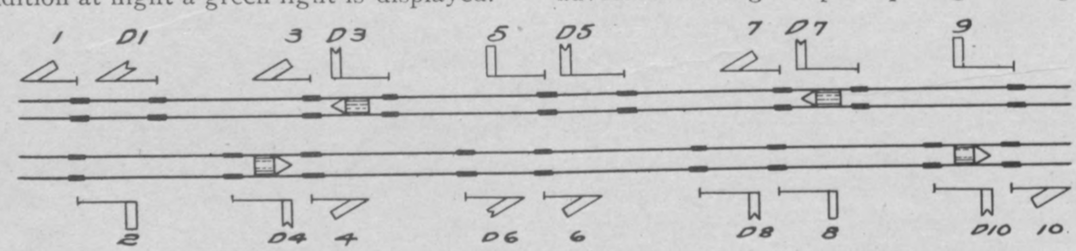


FIG. 3

Fig. 2 illustrates an arrangement of semaphore automatic block signals on double track where the home and distant arms are on the same post. Home signal 5 and distant signals D5 and D3 are indicating stop and caution respectively due to a train in the block of signal 5. The train in the block of signal 9 receives a caution signal D5,

A normal clear signal is one which indicates proceed, block clear, at all times excepting when the condition of the block is such that a stop signal should be given, as when there is a train or an open switch in the block.

A normal danger signal is one which indicates stop at all times excepting when the block is clear and a train, or some condition of the same effect of a train, is within a certain section or sections approaching the signal.

There is a great variety of circuits for the operation of either method, but it is the intention to show only one simple circuit for each here.

Fig. 4 is a typical normal clear wire circuit. Assume that a block TV, which is divided into two track circuit sections TU and UV, is protected by a home signal T and its distant signal S. A, B and C are track relays normally energized and operating through their front contacts the control circuits for the signals. E is the control relay for the home signal, and its circuit, which is normally closed, is from common wire through battery Q, front contact of relay C, home control wire, front contact of relay B, electro-magnet of E and thence to common wire. Relay E controls the operation of the motor J and the clutch magnet K which holds the signal clear. Battery R operates the motor J and energizes the clutch K. Circuit breaker O serves to automatically open the motor circuit when the signal has cleared. D is the control relay for the distant signal, and its circuit, which is also normally energized, is from common wire through battery Q, front contact of relay C, home control wire, front contact of relay B, circuit closer P, distant control wire, front contact of relay A, control relay D and thence to common wire. Circuit closer P is closed only when home signal T is clear. The motor and clutch circuit of the distant signal is exactly like that of the home signal. A train in either section TU or UV will de-energize the track relay and set both signals. A train in section ST will de-energize track relay A and set distant signal S.

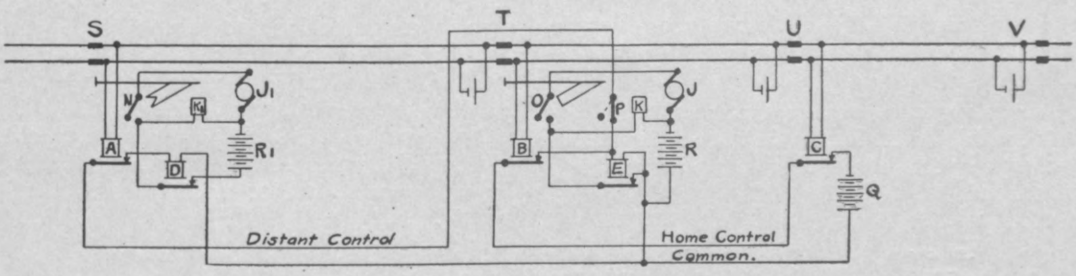


Figure 4

Fig. 5 is a typical normal danger wire circuit. The block DF, which is divided into two track sections DE and EF, is protected by a home signal D and its distant signal B. T, T1, T2 and T3 are track relays normally energized. Assume a train approaching B; when it gets into section AB, relay T3 is de-energized closing its back contact. Thus a circuit is made from common wire through back contact of relay T3, control relay L2, front contact of relay T2, distant control wire, relay J, control relay L1, front contact of relay T1, home control wire, front contact of relay T and battery K to common wire again. Relays L1 and L2 are of much less resistance than relay J. When the circuit is made relay J gets enough current to pick up its armature but relays L1 and L2 do not. The lifting of armature J closes a circuit from common wire through resistance R, which is equal to that of relay L1, front contact of relay J, relay L1, front contact of relay T1, home control wire, front contact of relay T and battery K to common wire. Thus relay L1 is energized and through its front contact the clutch and motor circuit operating home signal D is made. As soon as home signal D clears, circuit closer O is operated to shut out the high resistance relay J; this then enables enough current to pass through the circuit from battery K to pick up the armature of control relay L2 and thus operate the clutch C2 and motor M2 to clear the distant signal. When the train passes into the section BD, relay T2 is de-energized opening its front contact to put the distant signal B to caution and closing its back contact to maintain the circuit ahead to hold home signal D clear. When the train passes into section DE, relay T1 is de-energized thus setting home signal D at stop.

The location of block signals on a line to be signaled is a matter of much importance. The traffic, grades, curves, topography of the country, location of switches, water tanks, telegraph offices, stations, overhead structures, grade crossings, tunnels, etc. all need careful consideration.

The signaling of a double track railroad, because there is a track for traffic in each direction, is in many respects easier than signaling a single track railroad.

Each home signal governs only to the next home signal in advance. In this particular case signals D3 and D6 are distant signals for home signals 3 and 5 and 4 and 6 respectively. Since traffic is in one direction on each track, the signals furnish rear end protection only.

Fig. 7 illustrates a method of automatic block signaling single track. Since there must be both rear end and head on protection for trains, the signals must be located to meet this condition and their circuits so designed that the blocks overlap. The lines ending in arrows are intended to show the section of track over which each signal governs. With such an arrangement as shown in Fig. 7, it will be impossible for two trains to approach one another without each receiving a stop signal before they can meet, yet it will be possible for four trains following one another, or two trains headed toward each other, to be between two stations at the same time. The arrangement of signals and overlaps at passing sidings admits of two trains approaching each other very closely for the purpose of meeting and passing. As the overlaps are shown the direction rights should be for westbound trains.

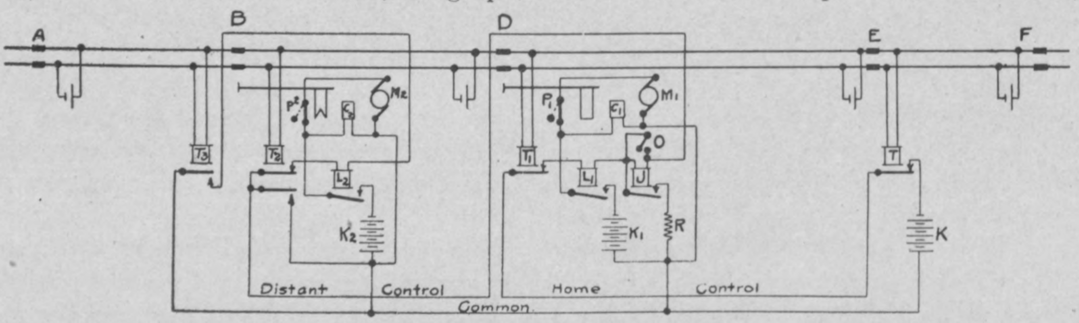


Figure 5

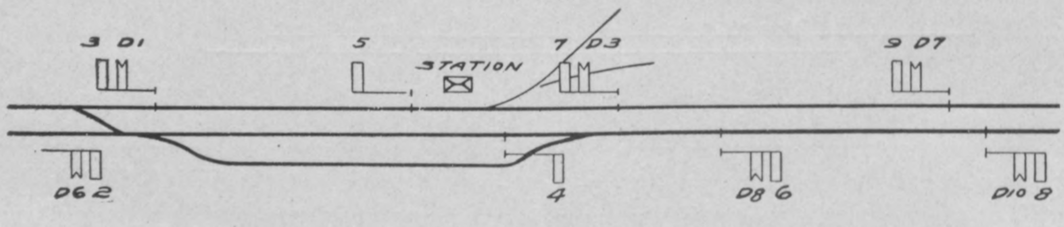


FIG. 6.

Fig 6 illustrates a scheme of automatic block signal location on double track. Signals 4 and 5 are what might be termed advance home signals because they serve to start a train which may have stopped at the station. Signals 7 and 2 are located so as to protect the rear end of trains which may be standing at the station as well as to protect against the possible wrong position of switches in their respective blocks.

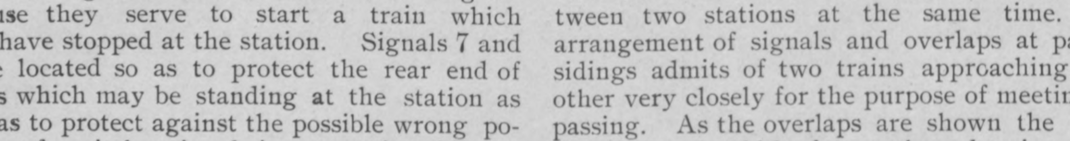


FIG. 7.

ALUMNI NOTES.

B. R. Putnam, '92, who has been Smelter Superintendent for the Bingham Consolidated Mining and Smelting Co., of West Jordan, Utah, is now a member of the firm of Dozier-Putnam Co., Assayers, Chemists and Engineers, at Redding, California.

G. W. Phillips, '95, is reported as being at present in Shanghai, China, in the service of the Reinforced Concrete, Steel and Tile Construction Co., of Detroit, Mich.

H. Blair Pettit, '03, is at San Francisco in the employ of the Western Electric Co., of Chicago. His residence is at Berkeley.

Hubert G. Parr, '05, died at Birmingham, Alabama, on July 11, 1907. He had been troubled with ill health during the latter part of his senior year at Rose, and after graduation spent some time in Colorado, hoping that the climate would be of benefit. He went to Alabama early in 1907, and was in Birmingham until his death.

O. E. McMeans, '96, and Herbert W. Foltz, '86, paid visits to old Rose on Nov. 14th.

Victor A. Hommel, '02, died at Sandusky, Ohio, on Oct. 18th, after an illness of several weeks.

Mr. Gustav Willius, Jr., '97, paid a short visit to the Institute on Ocbtober 9th.

Abe Balsley, '91, wrote recently from Bellagio, Lake Como, Italy, that he and Mrs. Balsley had just finished a trip on the lakes of Switzerland and Northern Italy, and were going to Milan, Venice and Rome, with the intention of landing in New York some time in December.

The engagement of William R. Heick, '05, to Miss Margaret Rood of Terre Haute was formally announced on October 19.

Ferdinand W. Hahn, '04, draftsman, with Rodger Ballast Car Co., Chicago, Ill., is now also connected with the National Dump Car Co., of the same city.

Howard A. Mullett, '04,was a recent Terre Haute visitor.

Harvey E. Rogers, '06, formerly with the Insley Iron Works, Indianapolis, Ind.; is now connected with Brown & Ketchum, Indianapolis.

Edward F. Robinson, '94, has been promoted to the position of Chief Engineer of the Buffalo, Rochester and Pittsburg Railway Co., with headquarters at Rochester, N. Y.

ROSE LEAVES

CONSTRUCTION OF THE PIERRE, RAPID CITY AND NORTHWESTERN RAILWAY.

By J. E. PHILLIPS, '09.

IN the summer of 1905 the Chicago & Northwestern Railway Co. located in South Dakota a line of railroad 176 miles long between Pierre on the Missouri River and Rapid City in the Black Hills. This was to be an extension westward of the line which this company had already built to Pierre and had for its object the supplying of transportation facilities to the settlers of a vast region west of the Missouri River, and the decreasing of mileage between Chicago and the Black Hills district.

Owing to the nature of the country through which the line was to pass, the only feasible route was to follow the valley of Bad River a distance of about eighty-five miles, thence along Bull Creek and Box Elder Creek to Rapid City. By following the valleys in this way the work of grading was not extraordinarily heavy. It was found also that a road could be built along this route with a maximum gradient of 1.5% and although there were many curves, the maximum curvature was 4°. The valleys however were narrow and the streams were crooked, making many crossings necessary.

Actual construction was begun in the early spring of 1906. The contracts for grading, building the bridges and laying the track were let to Winston Bros., M. J. Peppard & Co, and D. M. Roberts respectively. The last two companies named employed their own forces but practically all of the grading was sub-let to smaller contractors.

Slope stakes were set for a sixteen foot road bed and slopes of 1½ to 1 on embankment. Cuts were to be 24 feet wide with slopes of 1 to 1. It was found necessary however to make the side slopes in nearly all cuts 1½ to 1, for with the former slope the dirt would slide. The slope stakes were not reset to conform to this change of width but cross-sections were taken of all cuts when finished in order to determine the earth quantities. Surface ditches were dug on the uphill side of all side hill cuts to take care of the surface water. No steam shovel work was necessary, for the cuts were nearly all small and the haul short. The quantity of dirt, therefore, required in embankment greatly exceeded that taken from the cuts and it was necessary to borrow from adjoining pits. This required a right-of-way which varied in width from 100 to 250 feet, but since land is at present very cheap in that locality, this was not a very expensive item.

This soil found there consists principally of what is known as gumbo and when wet it forms the stickiest kind of sticky mud. A local way of expressing its adhesive qualities is that, "if you will stick to South Dakota when it's dry, it will stick to you when it's wet." Contractors were paid upon a basis of two kinds of material moved —*earth* and *loose rock*. The latter was not what the term implies, but was a sort of shale which in reality was almost as difficult to remove as solid rock. It could not be plowed or picked by hand to any advantage and could not be blasted as easily as solid rock. Upon exposure to the air it slacked and crumbled and in this condition was easy to handle. Several means were used to excavate in this shale but—slow as it was—blasting was found to be the quickest and most economical. Where possible, the blasting was done in the fall and the slacked shale removed the next spring. Shale was found at depths varying from six to thirty feet along nearly the whole length of the line and not only caused trouble in excavating but also made difficult the driving of piles for bridges.

It is customary for engineers to allow for shrinkage when making an embankment of loose dirt, but it was found by experience on this work that in dealing with gumbo the opposite effect must be considered. After several miles of grading had been done with the usual percentage of shrinkage allowed, it was found that, instead of shrinking in volume, the dirt actually swelled, and as a result in many places the grade was too high. This necessitated the cutting down of the embankment if near a bridge already completed or near a cut. Sometimes the gradient could be changed to conform to the embankment as built. This swelling property was not characteristic of all the soil encountered and as it was not easy to determine which would swell and which shrink, it became a difficult problem in setting grade stakes to know just how to set them in order that the final height of grade might be as planned.

As soon as the grade was completed, track was laid with a Robert's track-laying machine. Seventy-five pound steel rails were used with 12 inches of gravel for ballast. The work of grading and laying the track began at each end of the line and progressed toward the middle.

One of the most important features in the construction of this line was the building of the bridges. Of the 176 miles of line, 13.8 miles were of bridging. Bad River alone was crossed thirty-nine times in a distance of eighty-five miles. As has been said the valley of this river is narrow. High hills, broken by many draws, or gullies, extend along both sides of the valley. The river wanders aimlessly about from one bluff to the other, often doubling on its course, making horseshoe bends and all sorts of figures. The channel, however, is narrow and a single truss span was sufficient to reach from bank to bank. These were of the wooden Howe truss type and were placed upon piers made by driving three rows of piling of eight piles each. The approaches consisted of pile trestle work and varied in length from 300 to 800 feet. These long approaches were necessary because the river frequently overflows and an embankment would soon wash away. Permanent piling could not be placed in the channel of the river as it would be broken out in the spring of the year by the ice. In several places where the river made a horse-shoe bend, a channel change was dug across the narrowest part of the bend. By this means the railroad could be kept on the same side of the river and two trusses dispensed with. Pile trestle work was used for all creek crossings except those large enough to require a span.

Ten pile drivers were kept busy for a period of fourteen months putting in the piles for these bridges. Cedar and oak piles were used for permanent work and maple piles for the temporary work under trusses. Four-pile bents were generally sufficient but in some cases the height of the bridge made five and six-pile bents necessary.

All the material for the bridges had to be hauled overland by team and wagon from Pierre and Rapid City until the laying of track began. It was then taken to the end of track by train and then to the "front" on wagons as before. Material yards were located at Ft. Pierre and Rapid City and all material for the trusses was framed in the yards before sending out. At the Cheyenne River a three span bridge of the same type as the Bad River bridges was built. The temporary work for this bridge was taken out by ice last spring which delayed considerably its construction. To cross the Missouri River at Pierre a steel bridge was built.

Each engineering party had charge of about twelve miles of construction and consisted generally of about six members. This included the engineer in charge, an instrument man, rodman, tapeman, cook and driver. Pile inspectors also made their headquarters with the party whose sub-division they were on, Camps were located about the middle of the sub-division in order to make the drives to and from work as short as possible. Tents were furnished by the company as were also cots, blankets and provisions. A wooden frame work was built for the tents to make them more stable, and board floors were laid to increase the warmth. In one or two cases an empty log ranch house was found not only convenient for a camp but comfortable. Each party had to rustle for their own wood and in that country it is no small job. Trees grow only along the banks of streams and very few there. These are for the most part cottonwood and box elder and I will mention in passing that trying to split a cottonwood knot is about the best thing to work up an appetite I know of.

Although the camps were situated sometimes as far as seventy-five miles from town and ranch houses were far apart, camp life seldom grew monotonous. There was work enough to keep one busy most of the time and for the leisure hours there were diversions of various kinds. Wolves, coyotes, grouse and jack rabbits furnished sport for those with guns. Nearly every camp was supplied with two or three kodaks and and many evenings were whiled away by printing pictures. Some of the fellows were fortunate enough to own saddle horses and those who did not could borrow or hire from ranchmen. An occasional dance was given at neighboring ranch houses and these were always welcomed by the engineers as a good time was sure to be had. On the 4th of July we accepted an invitation to dinner at one of the other camps and in the afternoon attended a rope throwing and steer tying contest among cow punchers. It was the intention of a part of our party to make a seventy mile trip on horseback to the Bad Lands Christmas, but unfortunately circumstances prevented. Christmas, however, was by no means a dreary one; the company sent us out a turkey with all the proper embellishments for a real Christmas dinner and with these materials at hand the cook distinguished himself in a way that will long be remembered by those present.

Except for an occasional blizzard, the winter weather was ideal. It began snowing about Thanksgiving and from then until the 1st of March it snowed on an average of twice a week. There were no thaws during that time so quite a lot of snow had accumulated; when the thaw did come the snow all melted in about three days. The whole valley was flooded and this with the ice in the river did immense damage to bridges and grade.

TAKING CROSS-SECTIONS IN WINTER, SOUTH DAKOTA.

Borrow pits and cuts filled up with snow before many of them had been measured. It was necessary therefore to shovel a path in the snow every 50 or 100 feet the full width of the borrow pit or cut in order to take cross-sections. The accompanying picture shows one of the party shoveling a path through seven feet of snow. This snow shoveling lasted two months so it can be seen that measuring borrow pits in South Dakota during the winter months is not all plain sailing.

The road is now completed and is making itself felt, not only in the railroad world generally, but locally as well. The C. M. & St. P. also built a road into Rapid City and a rate war is imminent. Thriving towns have sprung up along the line where before there was nothing more than a ranch house in which a post office was maintained. The thousands of people who, in the last two years, have taken up government land there will be benefited thereby and the great grazing lands in that region which have fed millions of cattle for the market will be transformed into cultivated farms.

THE JUNIOR BANQUET.

In accordance with all school and class traditions the class of 1909 held their annual banquet in the Gym on the evening of October 31.

Previous to the banquet itself the Juniors tore up the front walk preparatory to laying their memorial, a new concrete walk from the gates to the steps of the main building.

The banquet was served at 11:00 o'clock after which toastmaster James N. Johnson arose and after a few introductory remarks the follows toasts were responded to.

"Athletics and other things"......FREDERICK J. FRISZ
"Society"......................WILLIAM H. BRANNON
"The Pathway to Knowledge"..CLARENCE W. SPROULL
"Some Advantages—'Lest we Forget'"..........
....FRED C. BURGESS
"The '09 Modulus" ....EDWARD M. BRENNAN
"Scenes seen through the Bottom of a Student's Size"..... ....HERBERT L. FREEMAN

After these toasts the class adjourned to the shops for their customary bonfire by the light of which the class numerals were painted on the smoke stack about 100 feet from the ground.

The assemblage finally broke up and departed for home about 4:00 A. M.

SOPHOMORE BANQUET.

The class of 1910 held its annual banquet on the night of Oct. 11 at Paris, Ill. A special car was chartered from the "Big Four" and forty-three of the jolly "tenners" were aboard when the train pulled out.

Arriving in Paris the men immediately started to take possession of the town. After a parade over the principal streets the "bunch" was headed for the hotel where the "feed" was spread.

Before entering the dining room the men were entertained by a negro quartette who rendered "Sweet Adeline" and several other of the latest and most popular Paris song hits.

The banquet hall was beautifully decorated in college style, college pennants, American flags and large "tens" predominating.

The music was looked after by a fine orchestra.

Enjoyment and "good fellowship" filled the large hall from the time the first course entered until the last speech was made. The following men answered to toasts:

The man who led us in our Freshman year..
......................A. A. BAREUTHER
Class Athletics................L. F. STRATTON
Bachelors and "Fussers" of 1910..........
........................C. E. WASHBURN
Good Fellowship................J. L. HERMAN
Last Year and the Morning After. H. M. SHAW
Give Me Chemistry or Give Me Death.....
....M. F. HAYMAN
How It Feels to be a Sophomore..A. G. BUTLER
Poly Elephant..................N. A. BOWERS
Pipe Rush........... ....A. A. PIPER
Speaking of Banner Classes ......J. T. SUTLIFF

After the banquet the class took in the principal sights of Paris, including the Court House, Y. M. C. A. and street car barns.

THE FRESHMAN BANQUET.

By E. A. MEES.

The first annual banquet of the class of 1911 took place on Oct. 22nd, at Sullivan, Ind.

With the advancing civilization certain disturbing elements—for want of a better name we designate these Sophs—which for years have entered into similar occasions at Rose, had been eliminated, and for the first time the Freshman aggregation could feast in perfect security.

Our special over the E. & T. H. R. R. left Union Depot at 6 P. M. on that memorable evening. Inasmuch as we had the entire evening, also a generous slice of the following day at our disposal, we were in no particular haste to reach the little village. That this was the general feeling which prevailed was demonstrated by a mysterious application of the emergency brake which brought the train to a very decided standstill. No arrests, with the exception of this particular one followed, for which we are very grateful.

Upon reaching Sullivan we announced our presence in unmistakable tones; what our cheers lacked in tone-quality was more than compensated for by the volume of sound. No alarming symptoms of consumption developed from these frequent outbursts until 10:30 o'clock, when all hands assembled at the Davis House to partake of the elaborate and abundant spread. The large dining-room was tastefully decorated in rose and white streams of tissue extending diagonally across the room forming a canopy over the long table.

During the process of the meal Ringgold's orchestra furnished excellent music which added materially toward making the banquet a success.

Toasts were responded to as follows:

The Class of 1911	E. A MEES
Daddy's Paste and Things	ROBT. STUMP
The Freshman Reception	LEONARD HOUSE
The "Tens"	OTTO B. HEPPNER
Dry vs. Wet	EARL G. BULLOCK
When Apples were Lemons	JOHN KETTERER
Poly Girls	EDW. L. PUCKETT
The Future	HENRY W. KER

At the conclusion of festivities a resolution was passed to cut classes the following day, and at 4:30 A. M. a very tired but nevertheless jubilant squad of '11s returned to Terre Haute.

As a preventative against too frequent outbursts of youthful enthusiasm, the faculty gave us a delicious double dose of—" expressly compounded for, etc."

THE CLASS OF 1907.

The addresses and occupations of the members of the class of 1907, as far as THE TECHNIC has been able to ascertain, are as follows:

Earl G. Albin, with Illinois Central R. R.

Wallace P. Andrick, with General Electric Co., Residence, 412 Summit Ave., Schenectady.

Harold S. Austin, with La Clede Gas Co., St. Louis.

Harry D. Baylor, with Minneapolis Gas Co., Minneapolis.

Luis Bogran, with Mexican Central R. R., Necaxa, Pueblo, Mexico.

Rufus L. Bond, with General Electric Co., Schenectady.

Dexter N. Byrn, present address not known.

F. H. Cash, with E. & T. H. R. R., Evansville.

Ren M. Davis, present address unknown.

Milton Goodman, Ass't City Chemist, Louisville, Ky. Address, 1718 4th Ave., Louisville.

Schuler P. Hall, with General Electric Co.; address, 308 Summit Ave., Schenectady, N. Y.

Warren W. Kelly, with Chicago, Milwaukee & St. Paul R. R., Milwaukee.

Delbert Krannichfeld, with Fairbanks, Morse & Co., Beloit, Wis.; address, 810 College Ave.

Donald McDaniel, with National Malleable Castings Co., Indianapolis.

R. J. McKenna, with General Electric Co.; address, 308 Summit Ave., Schenectady.

Morris Myers, with Loraine Steel Co., Johnstown, Pa.

Erwin J. Miner, with Stone & Webster, Terre Haute.

Frank A. Nantz, Ass't Chemist Vandalia R. R. Terre Haute.

J. Herbert Nichols, Draughtsman, Vandalia R. R., Terre Haute.

W. M. O'Loughlin, with Pennsylvania Railroad Signal Dept., Newcomerstown, Ohio.

Harry H. Orr, with C. & E. I. R. R., Chicago.

William R. Plew, Instructor in Civil Engineering, R. P. I.

Clifford W. Post, present address unknown.

Edwin C. Read, with Vandalia R. R., Terre Haute.

Thos. E. Routledge, with Pennsylvania Railroad Signal Dept., Allegheny, Pa.

Russell S. Sage, with General Electric Co.; address, 213 Seward Place, Schenectady, N. Y.

Chas. Scharpenberg, with Standard Oil Co., Bridgeport, Ill.

Alonzo D. Schofield, Jr., with J. S. Schofield's Sons, Macon, Ga.

Rudolph J. Schuhardt, with Dering Coal Co., Danville, Ill.

Harry M. Shickel, Instuctor in Mathematics, Wiley High School, Terre Haute.

J. Boyd Shickel, with General Electric Co.; address, 213 Seward Place, Schenectady.

Jas. R. Stalker, student at Illinois University, Champaign, Ill.

Robert Strecker, with E. & T. H. R. R., Evansville.

Howard C. Taylor, with Wapakoneta Machine Co , Wapakoneta, Ohio.

Cecil N. Trueblood, with Union Pacific Shops, Omaha.

Otto G. Whitecotton, with General Electric Co.; address 213 Seward Place, Schenectady.

Paul R. Wickliffe, with General Electric Co., address, 308 Summit Ave., Schenectady.

Y. M. C. A.

The newly appointed Secretary for College Associations of Indiana, Mr. Ernest Jaqua, of Iowa State College, gave an interesting discussion before the Rose Association on the subject of systematic bible study. The meeting was under the direction of the bible study department and the purpose of the meeting to arouse interest in the bible study and to enroll men in classes for study was realized. Four courses are now offered; 1st. The Life of Christ. 2nd. Studies in the Acts. 3rd. Studies in Old Testament Characters. 4th. The Political and Social Significance of the Teachings of Jesus. We are more than fortunate to secure one of Terre Haute's ablest lawyers, Mr. Charles Balt, to lead the class, who will make the work both profitable and interesting.

On Friday evening, Oct. 18th, Dr. W. L. Seaman, Professesor of Philosophy in DePauw University gave an interesting talk on Association work, using as a topic, "Reasons for Joining the Y. M. C. A." The talk was not cut and dried, but one full of wit and humor as well as things of profit. Dr. Seaman is a friend of Poly and Poly men, and we want him back to see us whenever opportunity affords it.

The State Convention of the Y. M. C. A. was held at Evansville, Indiana, November 7-10. Messrs. G. M. Curry, Richard L. Smith, Roy F. Tyler, John F. Robbins, K. R. Garst and J. B. Northcott attended as delegates from here. On Friday, evening, Oct. 15th, the time of regular meeting will be given to a social meeting. Eats are promised and a good time assured. A report of the convention will be made by the delegates at this time.

By the use of a few pennants and some new pictures the Association Reading Room has been made more cheerful. It is a hard proposition to keep the room in order. Show some of your college spirit in a practical way and be as careful of the reading matter as possible and when you have read a periodical do not throw it in a corner, but place it upon the table "in the corner." The Association welcomes you to its room and desires you to make as much use of it as possible.

CAMERA CLUB.

The Camera Club is enjoying a season of greater activity than it has known for several years. With thirty-four members, fourteen of whom entered pictures in the recent contest, the prospects for a successful year are very good.

Regular meetings will be held monthly, at which times journal reviews and lectures on photographic subjects will be given. For the beginners, Prof. Peddle has given two, of a series of three, lectures on Developing, Printing and Retouching. An enlarging camera is now being made and when this is completed photo-enlarging will be taken up by the club Lantern slides may also be made during the year.

Prize contests will be held every two months, and it is hoped that the small entrance fee required—enabling the club to offer better prizes—will cause an increased interest in the contests.

THE JUNIOR MEMORIAL.

On the night of Hallowe'en the junior class tore up the old brick walk between the front steps of the main building and the front gate, and on the following Monday a new cement walk was laid down, which bore the date 1909, in large figures of brass, set into the walk near the front gate. The walk greatly improves the appearance of the entrance to the Institute grounds.

The following notice which was posted in the Camera Club case early in October, explains itself

AGREEMENT.

We, the undersigned, members of the committees appointed by the Sophomore and Freshman classes, do hereby agree:

That there shall be absolute non-interference on the part of either class in banquet affairs.

(Signed)

A. A. Bareuther, Chairman.
L. F. Stratton.
C. E. Washburn.
N. A. Bowers.
Carl G. Blanck.
Sophomore Committee.

Otto E. Heppner, Chairman.
Harry W. Ker.
Philip A. Newhart.
Wilbur B. Shook.
William D. Wallace.
Freshman Committee.

James N. Johnson has been elected to succeed James A. Shepard as Business Manager of the Modulus owing to the fact that Mr. Shepard was unable to return to school this year. Clarence W. Sproull has been elected as Mr. Johnson's assistant. Fred A. Burgess has been elected to fill the position of assisiant editor made vacant by the resignation of Richard L. Smith.

An attractive little booklet printed in the most modern type of *de luxe* advertising literature and entitled "You Can Reduce Operating Costs" has reached us from the Electric Controller & Supply Co., of Cleveland. The matter within is devoted to explaining the methods of so doing, and should be of interest to those using electrical machinery of any kind.

On the evening of Oct. 16th, a number of the seniors gave a dance at St. Mary's. The weather was pleasant, although during the day preceding it had been threatening, and a very pleasant time was reported.

Stock, after the Senior dance: "I stepped on a girl's foot and all I could say was, 'I washed my feet this morning and they're all flying away, I can't do anything with them.'"

Doc. White: "You will please answer to your names." (Reads) "Washburn——Washburn?"

Washie (wakes suddenly and dimly remembers what the fellows have been calling out) "Beer!"

When Prof. Johonnott gave the Sophomores their last quiz he was compelled to invent some new marks for the paper. The alphabet from A to F being insufficient. G(=32.16) and O(=0) were added.

Stock, after Kerrick's adventure with the flywheel.—"Pap ought to apply for a pension on the ground of being a survivor of the revolution."

ATHLETICS.

MILLIKIN, 2; ROSE, 0.

On Saturday, Oct. 12, Rose met her second defeat, when Millikin University defeated us by the score of 2 to 0 at Decatur. The engineers outplayed the Millikin boys at every stage of the game and certainly deserved a victory.

Millikin's so-called safety should have been a touchback. It was made about the middle of the second half. Millikin was held and forced to punt, the ball rolling over Rose's goal line for a touchback. Rose then carried the ball out 25 yards and punted out to Millikin. The punt was returned and again rolled across Rose's goal line, but the officials claimed that Uhl carried the ball over, making a safety. Two of the officials, the referee and head linesman, said they did not see the play, but still they called it a safety, which we think was unfair.

The game was almost entirely a kicking game, there being 49 kicks during the game, Rose gaining a little on each one. The ball moved from one end of the field to the other, but each side would lose it before getting within striking distance.

Line-up:

ROSE	POSITION	MILLIKIN
Offutt	Left end	Penhallegon
Backman	Left tackle	Mills
Smith	Left guard	Ross
Schmidt	Center	Bell
Jewett	Right guard	Johnson
Standau	Right tackle	Bennett
Curry	Right end	Hull
Uhl	Quarterback	(Capt.) Wilson
Freers, Hadley	Fullback	Pease
Pritchard	Left half	Taylor
Abbott	Right half	Hamilton

SUMMARY.

Officials—Williams, Wabash, referee; Carrithers, Illinois, umpire; Prof. Morton, Decatur, head linesman.

Time of halves—30 minutes.

ROSE, 16; BUTLER, 5.

On Saturday, Oct. 19, Rose broke the hoodoo which apparently had been following her during this season by defeating the strong Butler team, on Poly campus. Rose outplayed the Butler team all around, and Butler's only points came when there was just 20 seconds to play, Myers picking up the ball on the 40-yard line and running across the goal.

Butler kicked to Rose and after a punting duel in which Capt. Pritchard came out on top, Rose began advancing the ball steadily by line bucks and end runs, and Standau was finally pushed over for a touchdown. Pritchard kicked goal. Butler kicked to Rose and ball moved from one end of the field to the other, and the half ended with the ball in Butler's possession on our 20-yard line.

Score—Rose 6, Butler 0.

Rose kicked to Butler. After an exchange of punts, Rose carried the ball to Butler's 20-yard line, where a drop kick was tried, but failed. Butler kicked out from the 25-yard line and Rose lost the ball on downs. After a punting duel, Rose started another march down the field and Backman went over for the second touchdown after 3½ minutes of play. Pritchard kicked goal.

Butler kicked to Strouse, who returned it fifteen yards and was penalized five yards for hurdling. Rose kicked and got the ball on a fumble and began a steady tramp up the field and carried the ball within one foot of Butler's goal line, where we were held for downs. Butler kicked and Strouse made a fair catch. Pritchard then made a place kick from the 25-yard line.

Butler kicked to Rose, Strouse making a nice return kick. Butler started up the field, and by forward passes and end runs placed the ball on Rose's 5-yard line, where Rose braced and held for downs.

In an exchange of punts Backman caught the ball and made a 70-yard run for a touchdown, but was called back for stepping three inches outside. The ball was then carried back and forth until Myers of Butler picked it up and went for a touchdown, but failed at goal.

Rose then kicked to Butler, and time was called with the ball in Butler's possession on their 5-yard line.

Line-up:

ROSE	POSITION	BUTLER
Offutt, Freers, Johnston	Left end	Myers
Smith	Left tackle	Thorp
Kroemer, Leeds, Wickersham and Bell	Left guard	Marsh
Schmidt	Center	Hartley
Jewett	Right guard	Roberts
Standau	Right tackle	Daniels, Wallace
Curry	Right end	Ritterman, Fitzgerald
Pritchard, Capt.	Quarterback	Macguire, Capt
Strouse, Reiss	Left halfback	Burnett
Uhl, Abbott	Right halfback	McKay
Backman	Fullback	Schmidt

SUMMARY.

Touchdowns—Standau, Backman and Myers.
Field goal—Pritchard.
Officials—Lunt, Tuft College; Orr, Westminster.
Head linesman—Douthett,
Time-keepers—Bernhardt, Fitzgerald.
Time of halves—25 minutes.

VANDERBILT, 65; ROSE 10.

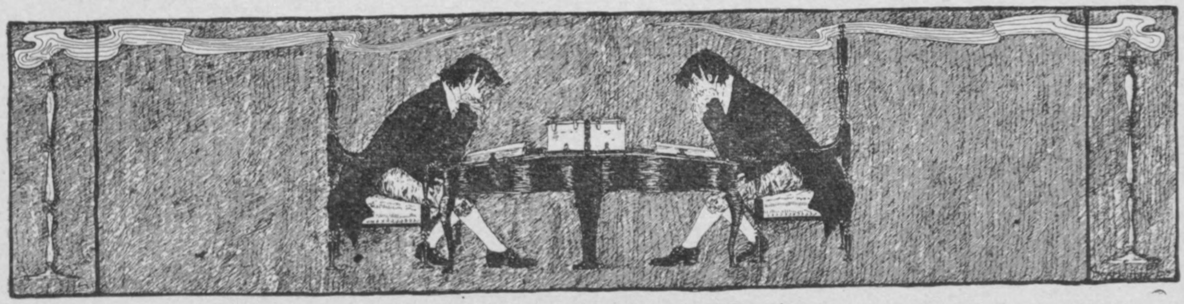
The game began at 3 o'clock, Oct. 26, Vanderbilt winning the toss and kicking off. Capt. Blake sent the ball 50 yards and Uhl returned it 15 yards. Pritchard kicked for us 50 yards Vanderbilt worked up to our 50-yard line and attempted a field goal and failed. Pritchard kicked out from 25-yard line. Vanderbilt then worked the oval down the field for a touchdown and kicked goal, making 6 to 0 in two minutes play. With only having the ball long enough to kick once Vanderbilt worked down the field again for a touchdown and goal, 12 to 0. We kicked off, and after Vanderbilt gained quite a little we were able to hold them, and they were forced to kick, but Uhl was downed in his tracks. Smith gained 7 yards through the line, and on an attempted forward pass we lost the ball. After the ball had passed back and forth a time or two, Strouse kicked 45 yards to Vanderbilt and on the first down they attempted to make a forward pass, which failed and Bell got the ball and ran 20 yards for a touchdown. Pritchard kicked goal and the score stood 12 to 6 for Vanderbilt. Vanderbilt kicked off, but soon made another touchdown and goal; score, 18 to 6 for Vanderbilt. This time we kicked off, and Vanderbilt fumbled and Smith fell on the ball on Vanderbilt's 25-yard line. We failed to make our distance from the 30-yard line, and Pritchard attempted a field goal, which proved successful. The score was 18 to 10, but still in Vanderbilt's favor. Vanderbilt had a hard effort to make their next touchdown and took considerable time in making it, but finally made a touchdown and goal. Score, 24 to 10. Freers went into the game in Curry's place at right end. Pritchard kicked off and Vanderbilt was successful in making another touchdown and goal; 30 to 10. Bell kicked off and Bob Blake returned the kick. Strouse rushed the ball to the Vanderbilt 10-yard line. Pritchard tried another field goal, but failed. After a few more downs, Uhl was superseded at right half by Abbott. Vanderbilt made another touchdown and goal, 30 to 10. This ended the first half.

In the second half Pritchard kicked off, and and after some hard fighting Vanderbilt scored a touchdown and goal; 42 to 10. Loeb took Smith's place. Pritchard kicked off and Vanderbilt worked down again for a touchdown but no goal; 47 to 10. With hard work they again scored a touchdown and goal; score, 53 to 10. Vanderbilt made two more touchdowns and goals, which made the score 65 to 10, but in that time Strouse heeled a fair catch and Pritchard tried a field goal, but failed.

VANDERBILT	POSITION	ROSE
Bob Blake (Capt.)	Left end	Offutt
V. Blake	Right end	Freers, Curry
McLain, King	Left tackle	Loeb, Smith
Hasslock	Right tackle	Standau
Hail, Perkins, Pitman	Left guard	Bell
Sherrell	Right guard	Jewett
Stone	Center	Schmidt
Costen, Potts	Quarter	Pritchard
Craig	Left half	Strouse
Campbell, Williams	Right half	Abbott, Uhl
Morton, Morrison	Fullback	Backman

Bradley Walker, referee; Anderson, umpire; Don Blake, head linesman.

Time of halves—25 minutes.



REVIEWS

Defects and Failures of Steel Tires.

The Railroad Gazette of October 25th contains a profusely illustrated article on "Causes of Defects and Failures of Steel Tires." A resume of the treatment of steel which is eventually made into tires for railway service, is given, beginning with the casting of the ingot and ending with the treatment received in service. The defects due to piping, gas cavities, etc., present themselves mainly in wheels made from short ingots, a short ingot containing metal enough for only one wheel. Long ingots, containing metal enough for three wheels, and allowing the upper end to be discarded, produce wheels of much better quality.

During the past few years, owing to increased severity of service, steel tires have frequently developed a condition on the tread known as "shelly" or "flaky" spots. It is in the nature of a breaking down of the tread into flakes or scales, by numerous cracks which penetrate into the tire, principally in the area of rail contact. The causes producing this condition may be inherent defects in the steel, such as pipe, gas cavities, slag and segregation, but are more commonly the conditions of service.

Inherent defects in the steel are confined almost exclusively to tires made from short ingots, and the appearance of the tread of a tire shelly from this cause is different from shelliness due to service conditions. Instead of the tread showing spots with numerous thin flakes, there is apt to be only a single spot from which a large shallow piece has spalled out, or there may be several spots where pieces have broken out of the tread. These defects are due to entrapped slag.

The conditions of service most prominent in causing shelliness are brake burns, unequal diameters of wheels on the same axle, and eccentricity of the wheel. A brake burn is the result of the wheel slipping on the rail, which produces several small hard slip spots, which are usually covered with irregular heat cracks, which under continued service tend to penetrate into the tire causing the steel to break up into shells or flakes. Many hard slip spots disappear through the friction of the tire on the rail or under the scouring effect of the brakeshoe, and eccentricity of the wheels results. The flat spots thus produced are often 30 to 40 inches long. Roads having heavy grades have little trouble of this sort, indicating that the tread is worn down faster by the brakes than the rate of penetration of the heat cracks in the burned area.

Driving tires are practically free from shelling. Brake burns and slip spots are apparent, but the rate of penetration of the cracks, owing to the great diameter and flatness of arc, is slow, and consequently their removal by brake wear is quite certain.

An Unusual Aerial Tramway.

The contractors' plant recently placed in service by George W. Jackson, Inc., in connection with the lake section of a new tunnel for the Chicago water works system, is described in the *Engineering Record* for Oct. 26th. The tunnel is to have a length of about 10 miles, extending from an intake crib 11,000 ft. off shore in

Lake Michigan from 68th St., to the southwestern part of the city. The construction is expected to be entirely in limestone bed rock, and its cross-section will a 14 ft. circle for 2¼ miles from the intake, and then of different sizes as the branches are taken off.

The unique feature of the plant is an aerial tramway which extends from a head house over the permanent shaft on shore, 8,000 ft. to a crib and head house erected at the top of the temporary construction shaft in the lake. It is carried at an average height of 35 ft. above the water by 24 four-leg steel towers, spaced approximately 300 ft. apart. The tramway will entirely preclude any necessity for tugs and scows that would be required to handle the materials excavated from the tunnel, to transport men between the shore and shaft and to deliver supplies to the latter. Rough weather prevails along this shore of Lake Michigan for a large part of the year, which coupled with the shallowness of the water over the tunnel, render impossible the operation of scows and tugs for considerable periods of time.

Each tower has an extreme height of 30 ft. 5 ins. and is 12 ft. square at the base, and 1 ft. x 2 ft. 1 in. in plan at the top. Each leg of the tower is carried by an extra heavy built-up steel pile.

The tramway proper consists of a 1⅜ in. carrying cable, and a ⅞ in. traction cable on each side of the towers. Buckets are hauled out on one side of the towers and back on the other. The buckets are built of steel, each bucket having a working capacity of 10 cu. ft. The traction cable has a normal traveling speed of 300 ft. per minute when the tramway is loaded. Under regular operating conditions about fifty buckets can be in service on the tramway, spaced 300 ft. apart. Switches for storing buckets are located at each head house. For the use of men several enclosed cars have been built, which are oval in cross-section, being 4 ft. long, 5 ft. high and 3 ft. 3 in. wide, having a light steel frame covered with sheet iron. The entrance is through a door in each side, which closes tightly, making a comfortable conveyance in all kinds of weather. These cars will seat four persons.

Progress in Electro-Metallurgy.

The concluding half of an article on Applied Electro-Metallurgy appears in the *Engineering Magazine* for November. The use of the electric furnace for the production of alloys of iron with silicon, chromium, manganese, tungsten and vanadium is touched upon, most of this work being done in France and Switzerland. These alloys are used in armor plate, in motor car work and for special purposes.

The methods of production of iron and steel by the electic furnace have been developed chiefly by French electro-metallurgists. The Heroult and Kjellin methods of steel refining by electric heat have shown the most striking development and are being used by many firms in Europe and America. The Heroult steel-refining furnace is of the crucible type, the first heating being by means of the electric arc. When the slag is melted the carbons conveying the current are lowered until they touch it, and the heat due to electric resistance is obtained. The slag is removed from time to time as necessary. The Kjellin furnace was developed at Gysinge in Sweden, and utilizes induced currents, the heating effect being obtained by the rapid changes in the magnetic state of the iron or steel which forms the secondary coil of the circuit. It is in reality a large transformer and its advantages are the development of heat just where it is wanted and the absence of impurities picked up from electrodes.

In the refining of lead, the Betts refining process is in use at Trail, British Columbia, and at Newcastle, England. The separation of the lead from other metals is reported to be almost perfect. Nickel is being electrolytically obtained at Papenburg, Germany, and at Sault Sainte Marie, Canada. Siloxicon and silicon are being produced at Niagara Falls. Metallic sodium is being largely produced by the Castner cell and process, and a cell and process has recently been patented looking toward the substitution of sodium chloride for the hydrate. The production of tin and zinc by electrical means is also being worked upon.

Spectacles

Properly Fitted by
First-class Optician

J. M. BIGWOOD,

Jeweler and Optician

607 Wabash Ave. **Terre Haute, Ind.**

Special Attention given to
Fine Watch Repairing.

Headquarters for
Poly Fobs, Pins, &c.

WM. SCHONEFELD'S

Pharmacy

Drugs, Toilet Articles, Stationery. Etc.

Cigars, Tobaccos, Candies.

PRICES MODERATE

Corner Seventh Street and Big Four Railroad

Opp. Big Four Station. **TERRE HAUTE, IND.**

Northern Cafe

SPECIAL ORDERS
MEALS, LUNCHES
AND
FRESH OYSTERS

SMITH & WILLIAMS

THE COLUMBIAN LAUNDRY

WILL DO YOUR WORK, AND DO IT WELL.

BAREUTHER WILL SEE TO IT IF YOU LET HIM KNOW

L. D. SMITH,

Dealer in Sporting Goods
and Athletic Supplies . . .

News Dealer, Stationer and Book Seller.

ALL THE LATEST COPYRIGHTED NOVELS ON SALE
AS SOON AS PUBLISHED

673 WABASH AVENUE.

Jno. G. Heinl & Son,

..Florists..

129 South Seventh St.

Terre Haute, Ind.

You will always find all of the New Styles in Clothing, Gents' Furnishings, Hats and Shoes at our store.

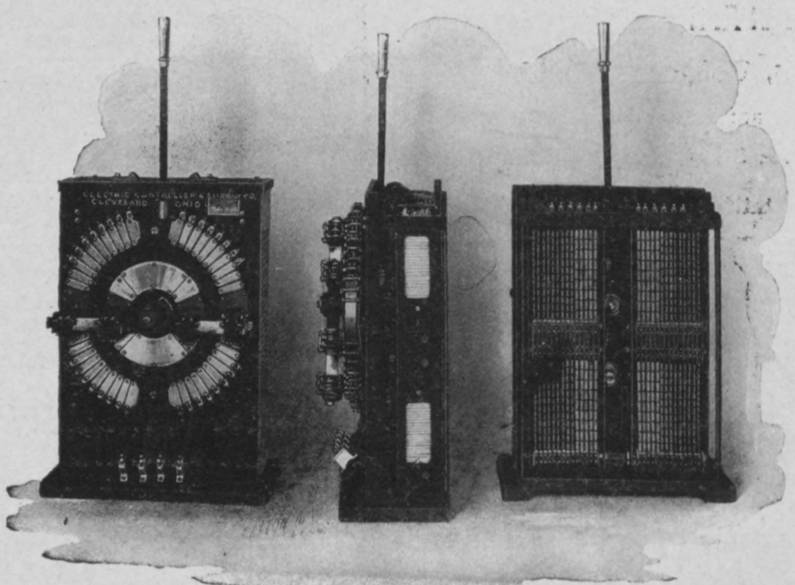
We sell Hanan and Son's Fine Shoes for Men. Also the celebrated Walk-Over Shoe. For the correct styles, come to us.

TUNE BROS.

CASH CLOTHIERS, HATTERS and FURNISHERS **FIFTH AND WABASH AVE.**

DINKEY VENTILATED CONTROLLERS

BUILT 1 TO 100 H. P. **COIL OR CAST GRID RESISTANCE**



DINKEY VENTILATED CONTROLLER, CAST GRID RESISTANCE

Adopted as a standard to the exclusion of all other makes of Controllers in most of the largest steel plants in the country

Simplicity of construction and easy access to all parts which are interchangeable are a few of its many good points.

Resistance grids and coils can be removed or replaced without dissembling.

For cranes, charging machines, and service which is severe and where accurate control is essential, they never fail to make good.

WRITE FOR BULLETIN No. 99

THE

ELECTRIC CONTROLLER & SUPPLY CO.

CLEVELAND, OHIO.