STAGE OF THE NEW THEATRE A TRIUMPH OF INGENUITY

The Machinery Cost More Than a Quarter of a Million Dollars and Contains More Than One Million Pounds of Steel.

The revolving stage at The New Theatre is said to be the most intricate and yet, in its operation, the most simple device of its kind in the world. It is sixty-four feet in diameter and revolves in one minute. It is made up of eight transverse sections and four segments, weighing altogether 56,000 pounds. There are more than one million pounds of steel in the stage machinery alone and it requires 700 horsepower to put it in full operation. The cost of the stage machinery alone was over $250,000. The device is the invention of Claude L. Hagen, technical director of The New Theatre.

In describing the stage for Tribune readers Mr. Hagen said:

"The first revolving stage was in use during the sixteenth century by the Japanese. It was merely a round turntable. Since then various modifications have been devised. The stage of The New Theatre is a distinct type, inasmuch as it revolves, moves backward and forward, or transversely and up and down, as a whole or in parts. It also permits sections of the transverse stage to be dropped and the rest of the sections to be opened so as to form sinks or cuts through which to lower whole sections.

"The main or underlying stage consists of eight members, each 7 by 48 feet. Each one of these members is operated by a vertical screw at each end so arranged as to work as a unit or as a whole. The transverse section consists of the same number of members, each supplied with telescoping wheels on each end so arranged as to engage with or be disengaged from a trackway on each side of the stage. Each one of these members is supplied with its own motor power, pneumatic drops, switches and telltales, for the purpose of safety and registering their positions. On the top of the transverse sections are 360 radial rollers, each pointing to the exact centre of the revolving stage floor.

"The revolving stage floor consists of eight sections, 7 by 48 feet each. These sections, when not used as a revolving floor, form the top floor of the transverse sections. At each side of the square formed by these eight sections is the segment which, when locked together with the eight transverse sections, forms a circular slab 64 feet in diameter and 4¼ inches in thickness. Two scenes may be built upon this stage—one facing the audience and one facing the back wall. When the first scene is through, the stage can then be revolved, bringing the second scene to face the audience, after which the first scene can then be taken from its place and the third scene set.

WAITS ALMOST ELIMINATED.

"This stage enables us to reduce to a minimum the time between scenes. In so far as we are concerned, we could produce the scenes one after another without an appreciable wait—that is, when all the scenes are set beforehand. The only thing that we have to do in such cases is to put in a new backing or a drop to make each scene complete. In 'Antony and Cleopatra' the palace scene was so large that we could not revolve the stage. In the case of 'Strife' the four scenes were set complete beforehand, each scene taking up approximately one-quarter of the stage. One advantage of this scheme is that the audience can look through a doorway from one scene into another, thereby giving a more natural and comprehensive view of the setting of the play.

"The plan at The New Theatre is to divide a performance into two parts, with a long intermission of fifteen or twenty minutes. The time between the acts in each division is from one to three minutes. In 'The School for Scandal' we made six changes in six minutes. These scenes were so heavy that they had to be moved on trucks.

"We produced 'Don' and 'Liz' with no intermission between them. 'Liz' is a one-act play, and as it is set complete, with 'Don' on the revolving stage, we pass directly from 'Liz' to the first act of the longer play and have our intermission between the first and second acts of 'Don.'

"The stage is not yet completed. When it is we shall be able to produce startling effects. Ultimately we shall abolish the curtain altogether and present a series of acts without interruption. The intermission will be determined then by those in the audience—when they are tired we shall pause while they go out for tea or a promenade.

"The stage will be so constructed that we shall be able to raise or lower any section of it, separately or in conjunction with others. In fact, it is so constructed now, but in its complete form it is not yet in working order. We can build a scene on the first seven sections, for example, present it and then lower it into the cellar to a sufficient depth so that the eighth section, on which a scene has been set, may be driven forward sixty feet a minute to the front of the stage. Each transverse section or cradle has its lower section or bridge, and we can build scenes on both.

"For example, Nos. 5, 6, 7 and 8 bridges, with their cradles and top members, may be lowered to a sufficient depth to allow cradles Nos. 1, 2, 3 and 4 to be moved to the back of the stage. Then bridges Nos. 1, 2, 3 and 4 may be screwed up until they are level with the permanent stage floor, and on them we can set a scene. A second scene may be built on cradles Nos. 1, 2, 3 and 4. When the scene upon the first four bridges is finished it is lowered into the cellar; then cradles Nos. 1, 2, 3 and 4 are driven forward to occupy their original place, and bridges Nos. 5, 6, 7 and 8 are screwed up, so that the wheels of their respective cradles may be thrown on their trackways and a scene be built upon them. These mechanical movements may be continued until the sections are in their original positions.

"The revolving stage floor may be lowered or raised a distance of thirty-two feet. There are trap doors which may be used for graves or for scenes such as one in 'Antony and Cleopatra.'

"Each cradle is so constructed that it will bear a load of five thousand pounds in addition to its own weight. This means a load of ninety pounds to the square foot."

One of the most remarkable devices connected with the stage is the counterweight system for the raising and lowering of scenery. Instead of relying for this purpose upon electric motors, which are notoriously unsafe in time of fire and unwieldly at all times, Mr. Hagen has invented an ingenious device, in which he uses small shot to balance the weight of the "drops" or scenery. In explaining this system Mr Hagen said:

"The machinery consists of an elevating rod or batten made of steel pipe sixty-six feet long, to which the batten of a scene roll is attached. The elevating batten is carried by five wire ropes, which, passing over their respective sheaves or wheels, hung up under the roof trusses 124 feet above the stage, are led to the south wall of the theatre over a single five-grooved sheave downward and attached to a counterweight box. This box is 3¼ inches by 14¼ inches in cross section and 6 feet long. It runs down a vertical shaft 117 feet long. Mechanism is provided by which shot may be dropped into the counterweight box at will. By adding shot to the counterweight box the additional weight will raise the elevating batten, unrolling part of the scene roll lying on the stage until a balance is restored. Thus the entire scene may be unrolled and balanced by the shot counterweight box.

"A seven-eighths inch rope, known as the haul rope, has one end attached to the top of the counterweight box, passes over two sheaves hung to the roof trusses, then downward to a point below the stage floor around two sheaves and up again, its other end being attached to the lower end of the counterweight box. Thus, since the scene and counterweight box are in perfect balance, the scene can be readily moved up or down by means of the haul rope.

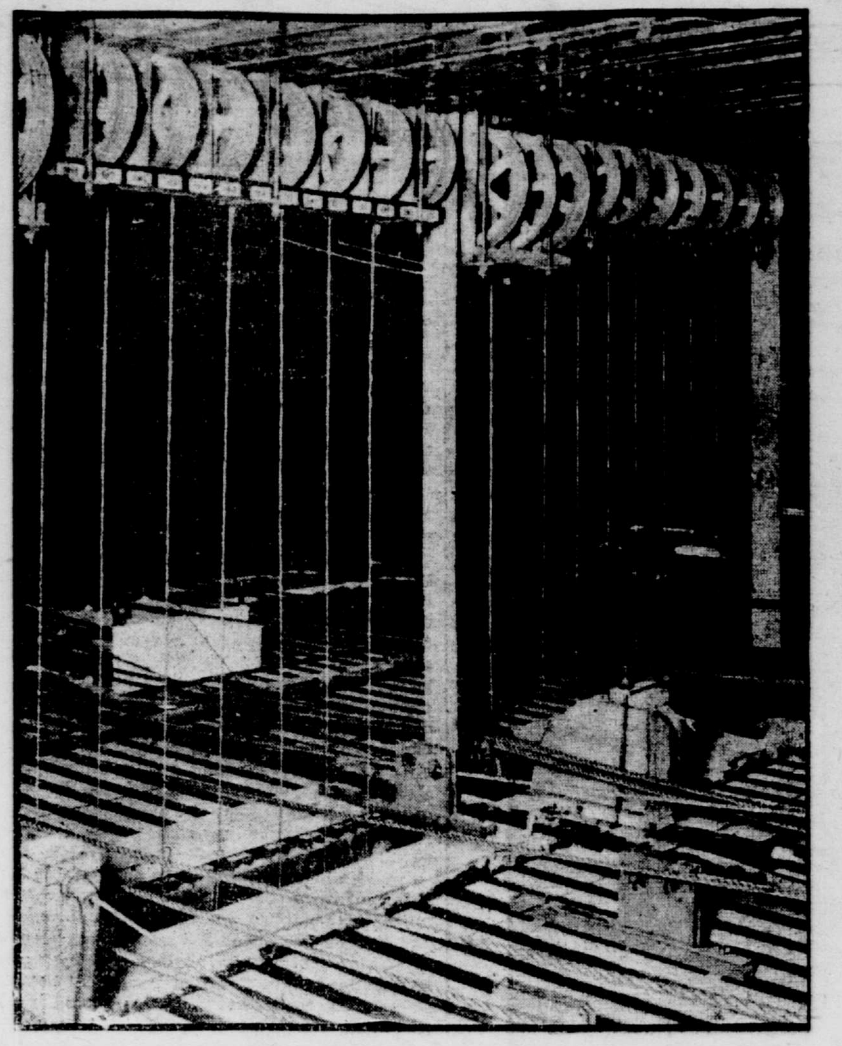
"To the bottom of the counterweight box is secured a valve, which, when opened, will cause the shot to run out of a long tank above, gradually changing the relation of balance between scene and box, causing the scene to drop slowly. A rope attached to this valve runs upward to the top of the counterweight shaft, over a sheave and downward to a point below the stage, around a sheave and up through the shaft to the valve. By means of this continuous rope the valve of the counterweight box can be controlled from any level at all times. There are 125 sets of counterweight units.

"Above the top of the 125 vertical counterweight shafts is placed, horizontally, a sheet metal trough, which is provided with an opening and controlling valve above each shaft. This trough is kept supplied with shot, uniformly distributed.

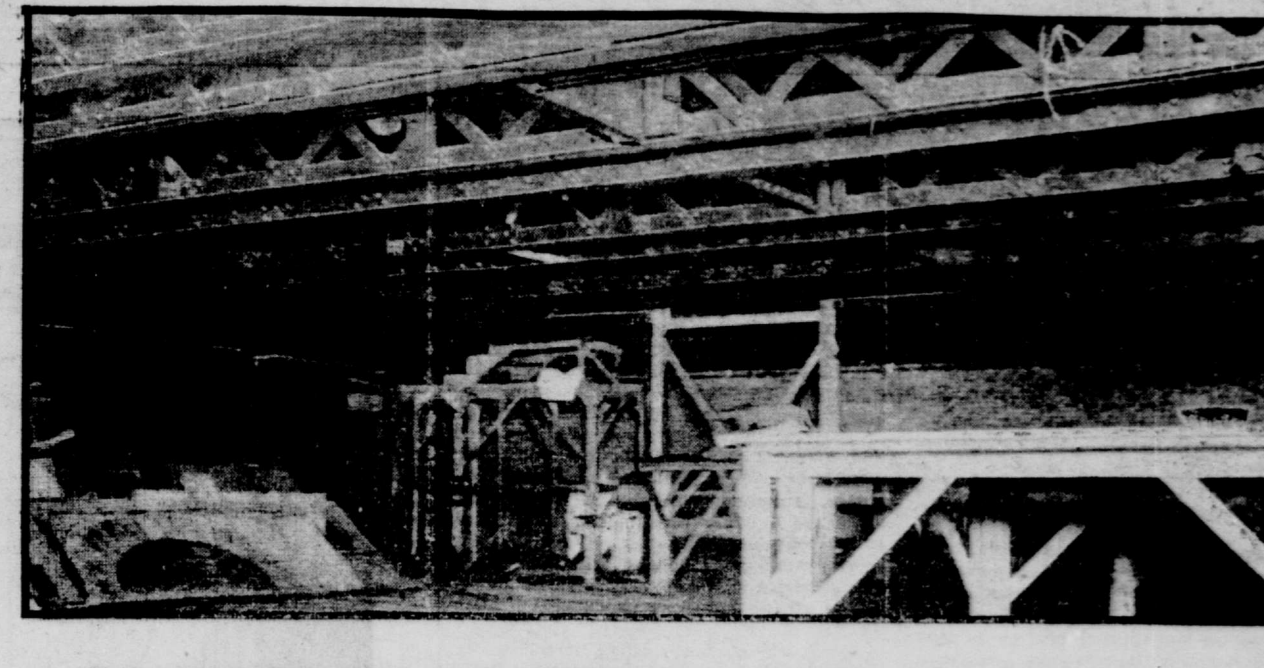
"The lower end of the counterweight shaft beneath the stage opens into a large chamber, into which all shot discharged from the counterweight boxes flows. The bottom of this chamber is pitched from either end toward the centre, so as to concentrate the shot there and deliver it through a spout to an elevator boot.

"A scoop bucket elevator raises one thousand pounds of shot a minute a distance of 135 feet, where it is discharged into two inclined chutes directly over the horizontal shot trough."

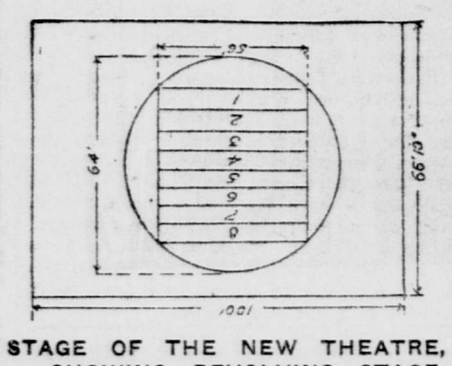
This system is delicately adjusted and so simple that in case of fire 125 drops can be lowered in two minutes and the scenery removed from the danger zone.



A VIEW BEHIND THE SCENES.
Showing steel cables used for raising and lowering the New Theatre scenery.



STEEL CRADLES SUPPORTING THE GREAT SPINNING STAGE OF THE NEW THEATRE.



STAGE OF THE NEW THEATRE, SHOWING REVOLVING STAGE, WITH TRANSVERSE SECTIONS IN THE CENTRE.

SOME NEW WONDERS

DR. ACHESON TO GET MEDAL FOR THEM.

Hardest Abrasive and "Revolutionary" Lubricant Products of His Furnace.

Dr. Edward G. Acheson, who will receive on Friday evening, January 21, at the Chemists' Club, in West Fifty-fifth street, the famous Perkin medal, has many times astonished the scientific world by his discoveries and inventions. He is considered the pioneer worker in synthetic electrochemistry, the record he has made being briefly summed up in these paragraphs:

1. The formation of carbides in the electric furnace, as typified by carborundum.
2. The transformation of non-graphitic carbon into graphitic carbon.
3. The direct reduction of metallic silicon.
4. The direct reduction of aluminum.
5. The production of siloxicon, a compound of silicon, carbon and oxygen.
6. The deflocculation of non-fused, non-soluble, non-metallic bodies.
7. The production of aquadag and oildag, products of high lubricating value.

Dr. Acheson is said to be the world's greatest electric furnace expert, but while others have thought of the electric furnace as a source of production of diamonds, he has applied its force and mysteries to the development of products beneficial to mankind and industry.

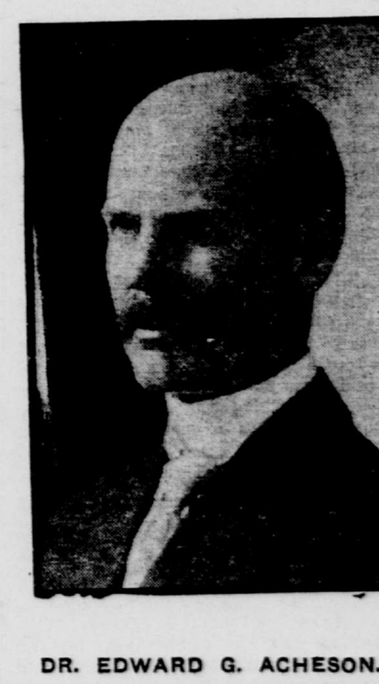
An interesting little anecdote is told of him which portrays his sentiments relative to making diamonds artificially. One who knew of his research wrote him at his laboratory, at Niagara Falls, N. Y., saying that he had discovered a process for making diamonds, but before giving it to the world he desired to visit him and compare notes, as it were. Dr. Acheson was very busy at the time and his conclusions were that if his correspondent had discovered a method of making diamonds he had little use for further information, whereas if he had not discovered anything new there was no use wasting time over it in discussion.

"Why should I seek a method for making diamonds?" was Dr. Acheson's question. "If I succeeded I would do nothing but depreciate the value of all stones of this character the world now has. I am very sure they would not thank me for this. The world does not need more diamonds. I want the work of my life to stand for something better."

MADE OF SAND AND SAWDUST.

Dr. Acheson's first discovery was carborundum, which product he gave to the world in March, 1891. He was then living and working in Monongahela City, Penn., where he used a dynamo of an electric light plant to carry on his experiments. The furnace he used was wholly new, while the raw materials were sand, coke and sawdust. Just what warrant he had for thinking these crude ingredients might have various of their qualities merged into a product that would be useful to the world is not known, but he combined the raw materials in such a way under the operation of his electric furnace that when he opened the furnace for investigation he found minute particles of a very hard substance.

He recognized that it would make an ideal abrasive, and with the world's production at that time in a small vial in his waistcoat pocket he hurried off to New York, where he sold it at 30 cents a carat, or about $60 in all, and with the proceeds he purchased a microscope to assist him in the further study of the material. To-day the production of carborundum amounts to about ten million pounds a year, which sells at about 10 cents a pound, whereas



DR. EDWARD G. ACHESON.

the first sale made by Dr. Acheson was at the approximate rate of more than $880,000 a ton.

The present popularity of this abrasive was not established without many ups and downs on the part of its discoverer. After he returned to Monongahela City he organized a company for its manufacture, and even when the total production of this comparatively small plant was not being marketed he conceived the idea of moving to Niagara Falls, where he planned the erection of a plant to consume 1,000 electrical horsepower. This bold conception of the possibilities of his new product so astonished the directors of his company that every one of them resigned, their argument being that if the product of a small plant was not consumed, certainly the production of a large plant would be a drug on the market. Dr. Acheson, however, had his nerve with him, so to speak, and he moved the plant to Niagara Falls, where the process has developed one of the largest industries there.

One day he discovered that when carborundum was heated to a very high temperature decomposition occurred, the contained silicon being dissipated in vapor and a beautiful graphite left as a pseudomorph of the original crystals. This unexpected discovery opened a new line of thought and research to him, and after a long series of experiments he gave the world a process for making graphite. This has resulted in another large industry at Niagara.

VARIED GRADES OF GRAPHITE.

Then came other experiments, and he soon determined that from particular forms of carbon graphite possessing certain definite chemical and physical properties could be made, so that in the process as it is operated to-day under the influence of the electric current of Niagara it is possible to impart to each grade of graphite made the qualities essential to successful use in the field to which it is to be applied.

His work compels the expression of astonishment from those who realize that in an electric furnace of practically the same design he determined how it was possible to make the hardest known abrasive, as well as the world's purest graphite, which is a lubricant. such results are revelations which have forced scientific men the world over to admire and praise his work. Twice he has received the John Scott medal. The famous Rumford medals were conferred upon him by the American Academy of Arts and Sciences, and now he will soon own the Perkin medal.

A book could be written about Dr. Acheson's accomplishments. Filter paper is made for the purpose of arresting solid bodies in liquids that flow through it, but Dr. Acheson has discovered a process for "deflocculating" graphite and rendering it so fine that it remains suspended in water or oil, defying successfully the laws of gravity, and when this graphite mixed with water is poured into a filter paper it will run through it without leaving a deposit on the paper. This has resulted in that new word "deflocculate" knocking for admittance to the new dictionaries, where it will soon have a place. Scientists have always known that nature left all materials flocculated, but they seem to have overlooked the possibility of "deflocculation" until their attention was called to the matter by Dr. Acheson's discoveries.

It has required a bold thinker, a man of original mind, to do the things this man has accomplished, for in none of his work, the work which has made his life's record a wonderful story, can it be said that he has followed the path of research blazed by another. He will be fifty-four years old on March 9, and he has a wife and nine children.

OILDAG AND AQUADAG.

Oildag and aquadag, the peculiarly but expressively named lubricants invented by Dr. Acheson, were explained in all details before the Society of Mechanical Engineers in the quarters of the United Engineering Society, in 39th street, recently, by Charles Frederic Mabery, professor of chemistry in the Case School of Applied Science, of Cleveland.

Oildag, according to Professor Mabery, is revolutionary. It decreases friction wherever it is applied to a bearing, and in decreasing friction increases available energy and accomplishes those results at less expense of money and material than any of the standard lubricants.

Oildag is a mixture of mineral oil and Deflocculated Acheson Graphite, the initial letters of the three words being taken to form the queer sounding second syllable. Deflocculated graphite is graphite reduced to a practical molecular condition, in which form it remains suspended in oil. The substance is mixed with oil in the proportion of 0.35 of 1 per cent of the weight of the oil and is applied like any other lubricant.

According to Professor Mabery, the new lubricant will require only half the quantity of material to produce a given result than is required without the use of graphite. He also believes that it will reduce friction at least 25 per cent, with an equivalent saving of power. He has tested oildag at the Case School, where the most advanced testing machinery is available. In applying the oildag during a series of experiments conducted by Professor Mabery, it was found that the Acheson discovery caused a deposit of graphite to form in the bearing under observation, and when the supply of lubricant was shut off the machine ran on for nearly two hours without heating or damage.

Other lubricants required a steady flow of oil to keep the machine running without damage.

For use in automobiles, oildag has been found to be of great advantage, increasing engine power and saving much to the bearings of the machines, particularly in hill climbing. Tests conducted by the Automobile Club of America demonstrated that its use increased the efficiency of the engines a little less than 10 per cent.

In illustrating the relative amount of graphite contained in the lubricant, Professor Mabery said that in three gallons of oil a bit of graphite of one cubic inch in bulk was sufficient.

VENEER OF GRAPHITE.

The effect of oildag as a gas engine lubricant is described as follows: The particles of graphite carried in suspension in the oil fill in all the irregularities in the metal surfaces, giving them a veneer of graphite that renders them highly polished and produces a fit between piston rings and cylinders that is far better than can be obtained in any other way between machined metal surfaces. When the hollows and metal "points" have thus been equalized the soft graphite moves within itself under pressure and affords the most perfect lubrication.

Oildag has been found equally efficient in many other types of machinery besides automobile engines. Aside from its economy of oil, increase of power and saving of the bearings themselves, it has proved wonderfully successful in cereal and textile mills where fires originating in hot bearings have always been a source of danger. The use of oildag practically precludes the possibility of a hot bearing, and consequently the new lubricant opens up a wide field of use in that direction.

Aquadag is identical with oildag in its composition, save for the fact that distilled water is used as the suspending medium instead of oil. Professor Mabery and other scientists are optimistic concerning the future of aquadag. They point out that the world's supply of crude oil is limited and subject to exhaustion, and that the demand for oil is increasing at a tremendous rate. The use of water in place of oil would absolutely preclude the possibility of fires originating in heated bearings.

The Perkin medal is named after Sir William Henry Perkin, who was the discoverer of the dyestuff "mauve," by which the foundation was laid of the coal tar color industry and a great stimulus given to the study of organic chemistry. It has been awarded to Dr. Acheson for his scientific work in the field of electro-chemistry by a joint committee representing the Society of Chemical Industry, the American Chemical Society and the American Electro-Chemical Society. This joint committee met on December 13, when the award was made, the formal presentation to be as stated.

Each year the names of a number of men prominent in the scientific field are presented for the consideration of the Perkin Medal Committee, and the award of the medal to a man means the approbation of his work by his fellow chemists and fellow scientists, it being recognized that the true philosophical mind works not for gold, but seeks science, which is more precious than gold. Thus, the award of medals such as this makes a man conscious of having done something worth while and acts as a stimulus and incentive to greater things.

This is the third time the Perkin medal has been awarded. The first time, in 1907, it went to J. B. F. Herreshoff for his work as a chemical engineer, and in 1908 it was given to Dr. Arno Behr for his contributions to the chemistry of the glucose industry.

MANY LIVES SACRIFICED BECAUSE OF FAULTY WATCHES

Webb C. Ball Evolved a System Which Results in Railroad Men Carrying Accurate Timekeepers.

By James B. Morrow.

Chicago, Jan. 15.—An unseen man, whose name, if mentioned, has made, perhaps, no impression, is helping the green lights, the white lights and the red lights, the wooden arms that reach across the tracks, the rail makers, the car builders and the train dispatchers to make travel both swift and safe by day and night.

It may be, in the way of protecting life and in the matter of saving legs and arms, not to mention heads, necks and backs, that Webb C. Ball, time expert on 125,000 miles of railroads, is beating all the hospitals in the United States and most of the doctors, besides. It may be.

If one's watch were thirty seconds slow or fast, it would make no appreciable difference in the routine of one's pleasure or business. Measured in feet, however, thirty seconds equal half a mile and more to the locomotive engineer of a high velocity special or a twentieth century flyer. A half-mile either way from the approximate spot of the running schedule might mean one hundred lives and a property loss of many thousands of dollars.

It is Mr. Ball's duty to see that the watches of engineers and conductors from New York to San Francisco and from Chicago to New Orleans are so nearly exact month in and month out that sidewiping and collisions, head-on and from behind, are at least theoretically impossible if orders are obeyed and signals are rightly read and not disregarded. Nearly all the great railway systems of the United States have put the technical details of their time into his management. He has offices in Cleveland, Chicago and San Francisco, and his assistants are travelling the country constantly.

Ultimately, of course, some man would have thought out his scheme of watch and clock inspection—as some other man than Morse would have invented the telegraph—but to Mr. Ball alone as a pioneer belongs the honor of its conception and perfection.

"When did you begin," I asked, "to regulate the watches and clocks of railways?"

BAD WATCH CAUSED WRECK.

"Eighteen years ago there was a bad wreck on the Lake Shore & Michigan Southern Railroad," Mr. Ball answered. "The fast mail, known as No. 4, was going east. An accommodation train was coming west. At Elyria, twenty-five miles from Cleveland, the engineer and the conductor of the accommodation were given orders to let the fast mail pass them at Kipton, a small station west of Oberlin, the university town. As the accommodation was leaving the station at Elyria the telegraph operator ran to the platform and verbally cautioned the engineer and conductor, although both men had been given their orders in writing."

"'Be careful,' the operator shouted. 'No. 4 is on time.'

"'Go to thunder,' the conductor called back. 'I know my business.'

"From the time the train left Elyria until it collided with the fast mail at Kipton the conductor, as he admitted afterward, did not take his watch out of his pocket. He said that he supposed the engineer would look out for No. 4. But the engineer's watch stoped four minutes, and then began running again, a little matter of life and death of which he was unconscious. There were several stations between Elyria and Kipton, but the engineer pounded slowly along in the belief that he had time to spare. Leaving Oberlin, he supposed he had seven minutes in which to reach the meeting point. Of course, he had only three minutes. Had the conductor looked at his own watch, he could have prevented the accident.

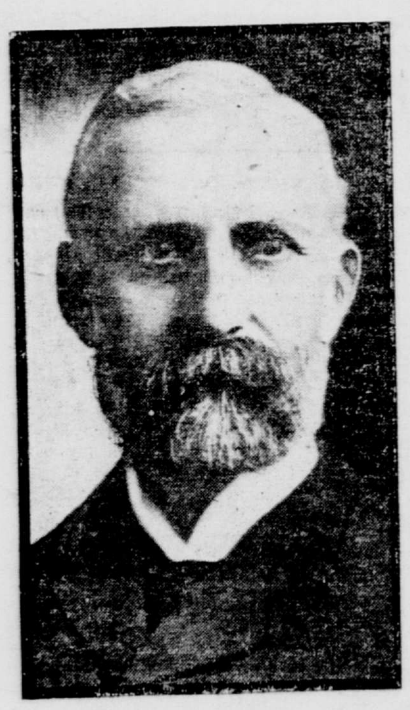
"The trains came together at Kipton, the fast mail at full speed and the accommodation under brakes, because it was nearing the station. The engineers of both trains were killed, and the dead bodies of nine clerks were taken from the kindling wood and broken iron of the postal cars. The railroad sustained a heavy loss in property, and a large quantity of mail matter was either lost or destroyed. There was an official inquiry into the wreck, and the coroner of Lorain County summoned me as a witness—as an expert in watches, I might say. The case was finally carried into the United States court at Toledo, and I went there several times to testify.

FINDS VARIABLE TIME.

"Returning to Cleveland on one occasion with John Newell, president of the Lake Shore road, and William H. Canniff, the superintendent, I suggested a plan of watch inspection. The Kipton acident proved that the watch of one of the engineers was unreliable, and that the conductor of the accommodation train had neglected his business. A meeting of the operating officers of the railway was held soon after, and I was authorized to get up a scheme of inspection and also to investigate conditions on all the important lines east of Chicago.

"I found that the conductors on the freight trains of trunk lines were depending on cheap alarm clocks hung on nails in their cabooses. Many merchants at that period were giving away bad watches with suits of clothing and furnishing goods, and engineers and conductors had such watches in their pockets, and were actually running trains by them, to the menace of human life and property. Some of the clocks in roundhouses and in train dispatchers' offices hadn't been cleaned, repaired or regulated for years. The rule then—and I suppose it prevented many frightful wrecks—was to give conductors and engineers five minutes extra on their orders; that is to say, a train due at 10 o'clock would be safe if it arrived at 10:05 or 9:55 o'clock.

"If one of the fastest limited trains now running on two roads from New York to Chicago is thirty seconds off its time, the conductor must report the fact at the first stop. I timed a fast train not long ago. We left Chicago on the dot, and kept on the dot to Elkhart, Ind., thence to Toledo, thence to Cleveland, thence to Erie, Penn.; thence to Buffalo, thence to Syracuse, thence to Albany, thence to Springfield, Mass., and finally to Boston, where we arrived on the second, after travelling hundreds of miles and changing engineers and engines eight different times. I hope I am not in bad taste when I say that the watches of the ten engineers and ten conductors of that train were regulated and inspected by my own men. Without watches of absolute precision, and dependable watches at that, eighteen-hour trains between Chicago and New York would be an impossible achievement.



WEBB C. BALL.

"But I have wandered away from my story," Mr. Ball went on to say. "After an investigation that covered four months I got my plans concretely formed and put them into operation. Local time inspectors, the best mechanics obtainable, were appointed at the end of every division on the Lake Shore road. Conductors and engineers were required to have their watches examined every two weeks. If a watch fell behind or gained thirty seconds in fourteen days it had to be repaired or regulated immediately. Small cards were given to the engineers and conductors and complete records of their watches were written down in ink at least once in two weeks by the official inspectors.

"Since then necessary details have been added to the plan, but the fundamental requirements have not been changed. Every conductor and engineer on the 125,000 miles of railroads where the plan is operative carries a little card in his pocket containing a full description of his watch and a technical history of its fortnightly performances. When he leaves his watch for repairs or regulation the inspector gives him a 'loaner watch,' as it is called, that is guaranteed to keep time to the fraction of a second.

"As the scheme developed, I passed upon certain kinds of watches. The manufacturers who had to be excluded from the accepted list threatened to sue me for damages, and for several years I had to endure all sorts of slanders and decline a good many benevolent suggestions. I now approve of thirty-seven different kinds of watches that are manufactured in eight separate establishments."

"Do all railroads have similar schemes of time inspection?" I asked.

"I suppose so. A man, copying some of the features of my plan, got on to an important road not long ago, and sold twelve thousand watches to the employes, getting $48 apiece for watches that cost him $5. Then the officers of the road fired him and sent for me. Several years ago forty passengers were killed on one of the biggest railways in the country. It was a case where the watches of the engineers and conductors did not agree, and all were wrong, I guess. I was called by telegraph to organize the line.

"An assistant whom I sent over the road as a telegraph operator in search of a situation learned that the clock at the operating headquarters was forty-five years old. Indeed, the clocks at telegraph stations and signal towers up and down the line and on all the branches were absolutely impossible for the purposes intended. The watches of the conductors and engineers were almost as bad. I threw away the clocks and condemned the watches, and if orders are obeyed there will be no more collisions on that particular road. The accident also cost the life of the general manager of the company. He died soon afterward of a broken heart.

"No one will ever know," Mr. Ball continued, "how many people have been killed because of worthless watches. In the old days, when watches went by hitches and jerks and there was no attempt at time inspection, the causes of accidents were covered up or denied altogether, and the public had to be satisfied with nothing more definite than its own guessing. Only recently several persons were killed in a collision because the engineer was running his train by a watch borrowed that morning from a female member of his household.

SOMETIMES READS WRONG.

"Occasionally an accident occurs because an engineer with a closed watch removes the case that is over the dial that he may see the hands and face and know the time at a hurried glance. The stem of an open-faced watch, you understand, is opposite the figure 12, while in a closed watch it is opposite the figure 3. Thus, if an engineer forgets himself, he may wrongly read his dial, and serious trouble is almost sure to follow. Not long ago a freight engineer with a watch so changed mixed his hands and his figures and made a mistake of fifteen minutes. Rounding a curve, he went head-on into another train, with fatal results to several employes and the wreck of two engines."

"Would it be practicable for railways to buy good watches and to issue them to its men whenever they go on duty?" I inquired.

"The Pennsylvania Railroad made such an experiment, but gave it up. Men were careless with the watches, and in some instances took them to pawnshops. The railroad employe is never compelled to supply any of the tools with which he works. In that respect he is favored over the carpenter, the mason and the ordinary mechanic. It is believed, however, that he ought to own a watch, and, being his personal property, he will take care of it and have a pride in it. I see that he is not overcharged; that he can pay his debt in instalments, and that his repair bills are always reasonable."

"What does a standard railroad watch cost?"

"A filled case—that is, a case with a sheet of gold on the outside thick enough to wear for twenty-five years—and a standard movement can be bought for $40. Fifteen years ago such a watch would have cost $85. There are many thousands of watches of the kind I have described that will not vary ten seconds in two weeks. The watches that I approve are adjusted to temperature, ranging from 30 degrees to 95 degrees, because the balance wheels of brass and steel change with heat and cold. They are also adjusted to five different positions. All standard railroad watches must contain at least seventeen jewels; some are made with nineteen and some with twenty-one jewels—any more than twenty-one would be useless. A watch manufacturer, several years ago, advertised twenty-six jewels—he screwed in the extra jewels as a tailor might sew extra and unneeded buttons on a coat. His talk sounded well and his watch looked rather gay, but the 30 cents' worth of additional jewels that he sold to railroad men for $9 were of no utility whatever. I had a long fight with him, but I compelled him to conform to my requirements.

"The jewels of a watch," Mr. Ball explained, "are its bearings. They are made of rubies or white sapphires, and the holes in some of them are so small that they cannot be seen with the naked eye. Most of them come from Switzerland, the ancient centre of the watchmaker's guild, where the fine touches of the art are passed on from father to son, generation after generation. Americans are too impatient and in too much of a hurry to bore invisible holes in rubies and white sapphires that are smaller than the head of a pin. Besides, the wages of the Swis watchmaker average only 7 1-3 cents an hour.

"We annually buy about $2,500,000 of Swiss watches and watch parts, the enamelled cases from that country being especially artistic and the main springs and dials being unusually good. Certain parts of the best Swiss watches are still made by hand, both in the homes of the workmen and at the numerous factories in the cantons of Berne and Neuchâtel. But American watches are the best for railroad use, because they are less complicated and keep just as accurate time. Our clocks are unquestionably the finest in the world, although the Germans make a clock that sells for $1,500.

"Watches were never so cheap as now and never so accurate," Mr. Ball said. "I am sure that the standards I have established for railroad purposes have greatly helped to bring the American watch to its present state of regularity and precision, which is good for the man who stays at home, but is infinitely better for the man who travels."

AGAINST CARELESS SHOOTING.

There is already a law in Maine for the punishment of persons who mistake another for a deer or other game and shoot them. The trouble is that it has been permitted to become a dead letter. It is believed by many that if this law were to be called into action there would be a marked decrease in the number of these "thought it was a deer" cases. That there is some reason for such feeling is shown by the results which have come from the attitude which two county attorneys in the state took toward the frequent railroad wrecks resulting in death of employes. They brought some indictments. The cases were tried, and while no one was convicted there was an immediate stopping of the take chances, careless methods which had been in vogue.—Lewiston Journal.

DOMESTIC FORECAST.

Missus—Cloudy and threatening.
Miss—Dull in morning; very fair in afternoon and evening.
Baby—Squally.
Butler—Unsteady.
Warnings from cook and housemaid.—Judge.