Frisco Chief Engineer Honored by Polish Medal for Service in France

Col. Frank D. Jonah Made Member "Swords of Haller" by Commander Polish Army

An honor that has been given few men in the United States, was conferred upon Col. Frank D. Jonah, chief engineer of the Frisco Railroad, and former chief of light railways in France, by General J. S. Haller, commander-in-chief of the Polish Army, during a recent visit by the General to St. Louis.

Col. Jonah was awarded the Polish decoration, "Miecze Hallerowski", the Order of the Swords of Haller, for "his faithful service to the Fatherland in France and in Poland, 1918-1920."

The Frisco's chief engineer had a brilliant career as a soldier during the late World War.

He went to France as a Lieutenant-Colonel early in the war days, and in August, 1917, went into the front line with the Twelfth Engineers. He served in Picardy on the British front until October 27, and was then assigned to the General Staff at G. H. Q. in Chaumont, France. He became chief engineer of the department of light railways of the American army, and for 19 months was continually in the zone of advance in charge of the transportation of supplies and equipment.

Col. Jonah knew General Haller well, and as chairman of the executive committee of the St. Louis American Legion, entertained the General on a visit to St. Louis in August, 1923.

The accompanying picture of the award shows a replica of the medal itself, in the upper center of the picture.

In the lower left hand corner the signatures of the president and secretary are attached, with the official seal of the Order of the Swords of Haller.

Translated, the award reads:

"The Polish Army, in France, Diploma, Frank G. Jonah, No. 898, Honorable Cause, receives the Order of the 'Swords of Haller' in commemoration of his faithful service to the Fatherland in France and Poland, 1918-20, Commander-in-Chief, (Signed) J. S. Haller."

The diploma pictured above, was awarded Col. Frank D. Jonah, chief engineer of the Frisco, by General J. S. Haller, Commander-in-Chief of the Polish Armies, in recognition of his "faithful service to the Fatherland in France and Poland, 1918-1920."

Tulsa Retail Merchants Take Frisco for Fast Service

Special Carried 125 Excursionists From Vinita to Tulsa and Return

A special train movement, accommodating the Tulsa Retail Merchants Association, called Trade Excursion No. 1, consisting of 125 people, moved over Frisco Lines from Vinita to Tulsa, April 28th.

This special was handled in three steel coaches and two steel baggage cars, delivered to us at Vinita by the M-K-T from their special train.

This train left Vinita at 3:05 p. m., April 28th, arriving in Tulsa 6:23 p. m., same date.

Here's a Good Example for Everyone

They tell this one on Geo. McBrayer, car inspector at New Albany, Miss.

He was recently in a shoe shop having some repair work done, and a leather salesman came in.

After interviewing the proprietor and displaying his line, he sold a bill of leather. But before he left, Mr. McBrayer had interviewed both the salesman and the proprietor and arranged for the leather to come via Frisco!

Moral! You never can tell just where you're going to pick up some business for the old Frisco!

Card of Thanks

We take this opportunity to thank the men of the Frisco System for the beautiful flowers and wonderful words of consolation during the illness and death of our beloved husband, father and brother. Your great-hearted sympathy in our hour of need has helped us to bear our loss, and for you, his friends, we will ever hold the kindest of thoughts.

Mrs. Arch Campbell and Family,
Catherine Campbell,
Duncan Campbell.

First Car of Radishes Handled by Frisco

Shipment From Blytheville Topped Market at Chicago and Arrived in Fine Condition

The first carload of radishes ever produced in Frisco territory was shipped from Blytheville, Ark., on Saturday, April 11th, reaching the Chicago market, Monday morning, April 13th. These radishes were of the early scarlet variety and packed in bushel baskets with alternate rows of radishes and ice, 500 baskets to the car. About 4,000 pounds of ice was placed on the load inside the car and the radishes moved under refrigeration. They arrived at the Chicago market in excellent condition and the trade was so well pleased with the quality and pack that they topped the market.

From present indications, there will be approximately twenty-four additional cars of radishes shipped from Blytheville this year. There will also be carlot movement of radishes from Leachville, Bay and Herman. In addition to radishes, this section is this year producing commercially, spinnach, cucumbers, cabbage, early potatoes and cantaloupes, an estimated movement of approximately 150 cars.

Frisco Special Trains Will Handle Confederate Veterans

Reunion at Dallas May 19-22 Will Draw United Confederates From Many States

Dallas, Texas, will be the scene of the United Confederate Veterans Reunion, May 19th to 22nd, 1925. Two special Frisco trains will handle the Veterans, Daughters of the Confederacy, Sons of Veterans and visitors to the Dallas reunion. Definite advice as to the number of special trains has not as yet been secured, outside of the two mentioned above, but the veterans will be handled from all parts of the south in special trains.

Last year the number of veterans to be handled so far exceeded the number originally planned for, that special trains were made up at the last hour.

Veteran of Forty-three Years Happy and Contented With Garden and Home

A. Schuler, Now Retired, Served in Many Departments of Frisco

Down in Springfield, Mo., a seventy-five-year-old Veteran lives in solid contentment among his flowers and garden. Although his service of 43 years on the Frisco was terminated in 1920, he is still a Frisco man at heart, and spends a deal of his time around the offices and shops of the Frisco Lines at Springfield.

ADOLPH SCHULER

Adolph Schuler, born in Alsace, France, December 6th, 1850, moved to St. Louis, U. S. A., with his family when he was three years of age. His education was received in the public schools of St. Louis, where he learned the trade of cabinet and mill worker and went to work.

He worked for the Frisco in Springfield for a time and then went to the Missouri-Pacific and the Atlantic and Pacific.

He returned to Springfield March, 1877, working in the B&B Department until March, 1878, when he was transferred to the coach department as cabinet maker. The work consisted of repairing coaches, building locomotive cabs, office and station supplies. The cabs were built at that time of black walnut with ash panels.

Promoted to Yard Foreman

July, 1887, Mr. Schuler was promoted to freight yard foreman, which position he held for seven years. At that time they began to change from link and pin coupling and air, to the present coupler. In 1894, Mr. Groves was in charge as Master Mechanic and Mr. Schuler was returned back to bench work. In subsequent years he was appointed as freight and coach inspector, three times as freight inspector and four times as passenger coach inspector, being at St. Louis, Mo., St. Charles, Mo., Jeffersonville, Ind., and also at Pullman, Ill., three times having 87 cars at one order, which he handled alone. Geo. Hancock was superintendent of motive power and appointed Mr. Schuler as coach inspector.

When Mr. Schuler returned from Pullman, Ill., he found the old north side shops preparing to move to the new west shops. He was then transferred to west shops as cabinet maker in July, 1908, which position he held until December, 11th, 1920, when he was retired account of the age limit. In all, he served in different capacities for the Frisco, 43 years and 8 months at time of retirement.

He was married at Seneca, Mo., to Miss Pauline Myers, December 24th, 1875.

Mr. Schuler enjoys *The Frisco Employes' Magazine*, and looks forward to it with pleasure each month.

Mr. and Mrs. Schuler reside at 1858 North Robberson Avenue, Springfield, Missouri.

JUDGE EVANS DIES

William Frank Evans, general solicitor of the Frisco Railroad, died at 7:30 o'clock Saturday morning, May 9, at St. Anthony's hospital, St. Louis, Mo. Judge Evans had been in ill health for several months.

He was born in Monroe County, Iowa, November 17, 1859, and was admitted to the bar in 1884, beginning his law career at Centerville, Iowa.

Judge Evans came to the Frisco in 1904 as assistant general solicitor and was made general solicitor in 1907, which position he held at the time of his death.

He was a man who made and held friends, and his death plunged the general office employes into deepest mourning. Every Frisco official and employe was shocked and grieved to hear of his demise.

The Magazine will print a full story of Judge Evans' eventful and interesting life in its next issue.

Changes and Appointments

Again we have a long list of agents appointed, agencies changed, and transfers made.

By the printing of this list each month, we hope to keep all those interested, informed of the different changes:

Effective March 1st, Wayne, Mo., made a joint agency with the M&NA, controlled by the Frisco.

C. B. Simmons installed permanent agent Fairland, Okla., March 19th.

E. L. Duren installed permanent agent, Winfield, Ala., March 20th.

A. E. McCans installed permanent agent, Kiefer, Okla., March 20th.

O. L. Jenkins installed permanent agent, McMullin, Mo., March 24th.

Effective March 23rd, Jericho, Ark., (Southern Division Memphis Sub-Division—MP 468.5) closed.

Effective March 25th, E. W. Sherman acting agent St. Louis-Broadway, vice M. H. Rudolph, deceased.

Effective March 31st, Oronogo, Mo., ticket only commission agency closed.

F. M. Garlock installed temporary agent, McBride, Mo., March 31st.

Effective March 30th, Beasley, Ark., ticket only commission agency closed.

Effective March 28th, Leith, Ark., ticket only commission agency closed.

H. W. Bray installed permanent agent Collins, Mo., March 31st.

L. H. Lokey installed temporary agent, Myrtle, Miss., March 31st.

Mrs. M. L. Stringer installed permanent ticket agent, Heyburn, Okla., March 30th.

Leslie H. Jaynes installed permanent ticket agent Tallipoosa, Mo., April 1st.

W. J. Paschal installed temporary agent phillipsburg, Mo., April 1st. (B. C. Jones in charge station from March 27th, handling in Foster's name until transfer.)

Ray Harpham installed permanent agent Plantersville, Miss., April 1st.

F. DeBerry installed permanent agent Hancock, Mo., April 1st.

J. W. Hull installed temporary agent, Soper, Okla., April 1st.

Effective April 1st, Emmet, Mo., ticket only agency closed.

Effective April 1st, Pennsboro, Mo., ticket only agency closed.

Effective April 1st, Pilgrim, Mo., ticket only agency closed.

Effective April 1st, Seligman, Mo., made a joint agency with the Missouri & North Arkansas R. R., controlled by the Frisco.

Effective April 1st, Clinton, Mo., (South Station) will be handled in name of C. O. Claiborne as agent at both Clinton, Mo., and Clinton (South Station) however, separate accounts will be maintained at South Station by an assistant agent-cashier.

Effective April 2nd, Lazarus, Kans., ticket only agency closed.

Effective April 4th, Oronogo, Mo., ticket agency re-opened, Bert M. Pippin re-installed ticket agent.

W. O. Batts installed permanent agent, Wilmot, Kansas, April 6th.

F. K. McDaniel installed permanent agent Henson, Kans., April 3rd (O. B. Ransom in charge of station from March 24th, handling in R. C. Schooley's name until date of transfer.)

Frisco Pensioners

(Continued from Page 9)

at Kansas City, Mo., in January, 1890. He served faithfully and well in various positions in the mechanical department until his recent retirement.

Pat Dewine, retired at the age limit 70 years, has 33 faithful years' service with Frisco as switch engineer at Monett. He held his first position in December, 1891, at Monett, and remained as switch engineer at that point throughout his entire service.

John Henry Hough, clerk, comptroller's office, St. Louis, has had a varied career of 25 years and six months in railroad service. He was born at Mascoutah, St. Clair County, Ill., January 21, 1855, and entered the service of the old K. C. F. S. & M. as a clerk in the office of the car accountant at Kansas City in November of 1884. He served at that point and in the office of the cashier and paymaster. Some years later he resigned and took service with the K. C. P. & G. railroad, with whom he remained until August 1, 1899. He then returned to the Memphis line, later coming to St. Louis. He is widely known in the offices at St. Louis.

Car Rebuilding

(Continued from Page 16)

Miner A-2-X friction draft gear, 24⅝" pockets and Imperial type "B" uncoupling lever attachment. All ladder and grab irons are made of ¾" iron, end ladders are riveted to ladder stile and ladder stile riveted to steel end. End sill grab irons are all riveted to end sill. Side ladder and grab irons are all bolted with ⅝" bolts and all sill steps riveted to side sills.

All joints of these steel cars were cleaned off and painted with Lucas No. 1 cement before riveting together and all steel parts of car painted with Lucas No. 1 cement, inside and out, before applying decking and side boards. Side boards painted with No. 136 primer, with one coat of Lucas No. 1 cement on top. This Lucas Cement is a flexible corrosion-proof material.

Capacity, 110,000; axle carrying capacity, 169,000; load limit, 127,500; light weight, 41,500; cubic feet, 1,742; length inside, 41' 6"; length outside, 42' 8"; height, 4' 8" width inside, 9' ⅛"; width outside, 10' 2⅞".

The splendid organization which we have at Yale is responsible for the cars being turned out so rapidly and the workmanship is of the very highest class. The up-to-date appliances which were placed on the cars, and the grade of material used in their construction, together with the high-class work done at Yale, make these cars the best equipment of that type which we own.

Commendation of Service

Enid, Okla., March 24, 1925.
PR-C.

Mr. F. W. Coleman,
Mannford.

I have just been informed by Mr. Canady of your noticing brake beam down and dragging on Extra 1613, Conductor Oliverson, Engineer Thomas, this morning, and my advice is that you stopped the train, notified the train crew, who removed the brake beam, and in all probability, your action avoided some trouble.

I want to thank you kindly for this service and to compliment you on your alertness, and it is with pleasure that I am crediting your record with fifteen merit marks.

(Sgd.) W. H. BEVANS,
Superintendent.

First Circus of the Year Handled by Frisco

Gollman Bros. Show of Five Cars Ran From Aberdeen to Sulligent, Ala.

The Gollman Brothers Shows, numbering 70 people, was handled by the Frisco, as its first circus train, on April 10th, for the southern states.

This train consisted of three sleepers and two baggage cars and was handled on March 10th from Aberdeen, Miss., to Sulligent, Ala. From this point they went to Carbon Hill, Ala., to show there on the 13th.

While this circus was a small one, it created a great deal of travel to the points where its tents were pitched, and for miles around the above named towns, farms were deserted while everyone attended the circus.

The King's Highway

(Continued from Page 15)

the Indians, although he did not establish a permanent post.

Later, in 1789, Don Louis Lorimier established a post and became its commandant under the Spanish crown. But the name of Cape Girardeau clung to the post, as the coureurs des boise had long known the promontory by that name, it being one of the marks along the river by which they could tell their bearings.

This promontory is still known as Cape Rock and today, where once Ensign Girardeau traded beads for pelts, the citizens of the modern Cape Girardeau swing clubs different from those of the Red Man and, instead of looking for scalps, endeavor to go around in par or less. And where, in the long ago, the red-faced tribe danced to the music of the tom tom about the council fire, today the palefaces step to the noises of the saxophone under electric bulbs.

During the last years of the Spanish regime many adventurous spirits from the new American states along the Atlantic seaboard crossed the river at Cape Girardeau, to become subjects of the Spanish monarch. Following the purchase of the country by the United States this influx of Americans became greater, so that in the early days of American occupancy Cape Girardeau became a place rather cosmopolitan and decidedly exciting.

Naturally, homeseekers in the country beyond the Father of Waters looked upon Cape Girardeau as the gateway into the Promised Land. Thus, after weeks or months of slow and tortuous travel from the Atlantic seaboard, their hearts were gladdened to see Cape Rock standing on the far shore of the stream which bordered the land of their destination.

Old Churches Still Stand

In the fertile valleys near Cape Girardeau, Americans first tilled the soil west of the Father of Waters; within a few miles of the village, in 1806, were established the first Methodist and first Baptist church west of the river. A little farther away was started the first Lutheran school and church on the western continent. The old school building still stands.

In the village of Cape Girardeau, in 1806, was opened the first licensed tavern in Missouri. Between two Cape Girardeans was fought the first duel by Missourians, in which the clerk of the first territorial court slew the keeper of the first tavern, to whom he had, just four months previously, issued a license to conduct his hostelry.

In the clear waters of Randol creek, near Cape Girardeau, Mrs. Agnes Ballou was baptized by the Rev. James Johnston in 1799, it being the first baptism by a Protestant minister west of the Mississippi River.

In the old cemetery at Cape Girardeau are the graves of Don Louis Lorimier and his Indian consort. In this same old burying ground are the graves of two Revolutionary War heroes, of a cousin of George Washington, and of scores of men and women who helped to carve an empire from the wilderness.

Just south of Cape Girardeau, on the Kingshighway, are the Capaha Bluffs, near which once dwelt the warlike tribe of Capaha. Near these bluffs, in 1541, De Soto camped for two days, while two of his soldiers, accompanied by Indian guides, went into what is now Ste. Genevieve County, to obtain salt for the Spanish army.

On southward, over the famous old road, one passes one of the first four farms tilled by a white man in the new country. As he passes this farm he may see, standing on an eminence, a monument erected to the honor of Lieutenant - Governor Wilson Brown, act of the state legislature more than three-quarters of a century ago, and said to be the only monument ever erected by the state legislature to honor a man who died in office.

During the Civil War, the Union troops built four forts at Cape Girardeau, one at each corner of the town. Today the sites of those forts tell the story of a united and prosperous people.

A MAGAZINE WITHIN A MAGAZINE

The Frisco Mechanic

Published in the interest of the F. A. of M. C. & C. D. Employes

VOLUME I JUNE, 1925 No. 9

The FRISCO MECHANIC
Published and Edited as a Department of the
Frisco Employes' Magazine

WM. L. HUGGINS, Jr.....Editor
MARTHA C. MOORE....Assistant Editor

Associate Editors
WM. UNDERWOOD .....Chairman
HOWARD PICKENS.....Secretary

The Editor will be glad to receive interesting contributions at all times.

"Sit Up and Take Notice"

A rousing interest in fuel conservation has been built through giving a gold star to the crew making a record fuel performance each month.

The following letter, although addressed to Messrs. Magers and Harvey, is in reality for every engineer and fireman on the Frisco system:

Springfield, Mo.
March 16th, 1925.

Mr. E. L. Magers,
Mr. J. L. Harvey:
Dear Sirs:

We wish to advise that engine 791 is one of the engines on the Eastern Division that is going to wear a gold star for fuel performance during the month of February. This was made possible through working reverse lever to center and by proper control of steam expansion.

We feel very proud to have this honor bestowed upon us, and would like to have this letter printed in the Magazine to encourage the engineers and firemen to "sit up and take notice" and endeavor to carry a star on every engine on the Eastern Division.

Respectfully,
T. E. Burgess, Engineer,
D. B. Aldrick, Fireman.

Safety Committee Appointed at Amory, Mississippi

W. H. Williams and J. E. C. Hunt to Inspect Tools, Lockers and Other Equipment

Messrs. W. H. Williams and J. E. C. Hunt have recently been appointed as a committee on Safety First, fire prevention and tool inspection.

Each Monday morning these men go over the entire grounds and different shops at Amory, Miss., inspect the tools and clothing lockers, locating small defects, collecting once in a while a tool which is worn or which will soon be unsafe for use, and making recommendations for changes in facilities in the interest of safety first.

Their object is to eliminate any possible cause for an accident.

Combustion and the Mechanical Stoker

By CARL D. JONES, Mechanical Expert—The Locomotive Stoker Company

The particular attention of Frisco enginemen is called to this interesting discussion and analysis of fuel saving by proper use of the mechanical stoker. It is gratifying to note that Mr. Jones pays high tribute to the efforts and efficiency of Frisco enginemen when he says, in referring to their record for 1924: "The records speak more eloquently than words for the proficiency of Frisco enginemen."

—W. L. H., Jr.

The writer, in preparing this paper, takes the view that each engineer and fireman, in that he may conserve the company's fuel, should have at least a practical working knowledge of the study of combustion. As the first consideration in a mechanical stoker should be the job of stoking that it does, it will be shown how the engineers who have designed mechanical stokers have not lost sight of this important consideration, and have designed the machines to conform with the rules of coal burning in locomotive practice.

First, we will consider the composition of bituminous coal, which is more generally used in locomotive service. Taking the Carbon Hill, Alabama coal as an example, we find the following analysis:

Fixed carbon, 51.74%, consists of coke, which is combustible; volatile matter, 33.15%, consists of combustible gases; moisture, 2.58% water; ash, 12.53% slate-bone-iron pyrites-clay, etc.; sulphur, .73%, a poor combustible, gives off little heat.

Assuming that the locomotive is working hard on the hill, the temperature in the firebox will be around 2,300° F. Then if a charge of coal be placed on the firebed, the first chemical change that takes place is that the moisture leaves the coal, as we have it subjected to this temperature and water boils and evaporates at 212° F. At the same time, the volatile matter, or gases, are being distilled out of the coal as it requires from 400 to 900° F. to cause coal to give off its gases. The temperature required to ignite these gases is about 1,400° F., so the 2,300° F. we have caused them to quickly ignite as they are given off and burn completely during their intrainment through the firebox, providing that a sufficient amount of oxygen is supplied and heated to the same temperature of the gases. Oxygen forms one-fifth part of the composition of the air which we breathe. The other element of the composition is nitrogen, consisting of four-fifths. These elements are not chemically combined, but are so mixed together that no chemical action is necessary to separate them. Burning cannot start, nor continue, unless oxygen is available, and as the oxygen has a greater liking, or affinity, for the volatile gases, than it has for the nitrogen, it leaves the nitrogen and mixes with the volatile gases of the coal. In that the air to be admitted over the firebed for the combustion of the volatile gases may be heated somewhat before entering the firebox, stokers are so arranged that the air in being drawn through the orfices provided, comes in contact with heated parts of the stoker or boiler sheets, absorbing some of their heat before mixing with the firebox gases immediately adjacent to such orfices. The air also, in being drawn through or around these parts which are subjected to the heat of the firebox, tends to keep them at less than fusing temperature, prolonging their life. The holes in the firedoor also, are provided for the purpose of providing heated air for the combustion of the volatile, as the air is drawn through the holes, striking the red-hot firedoor liner and being deflected around this liner, absorbing its heat before entering the firebox.

Fixed Carbon Burned Next

The next thing that happens to the coal after the volatile has been distilled off and burned is that the fixed carbon, or coke, is burned. Coke requires a higher temperature and a longer time to burn than gas, as it forms the bed of the fire, and burns slowly, from the outside, without smoke. The oxygen for the fixed carbon, or coke, is drawn through the grates, by the vacuum forming tendency of the exhaust steam in the front end. After the coke is burned, nothing remains on the grate, except the iron pyrites, sulphur residue and ash, which last named consists of the purely non-combustible matter, such as clay, bone, slate, etc. The iron, while it gives a slight heat, is a very objectionable property, as is the sulphur, as both are left in a molten state and any agitation of the firebed, as from grate shaking or the rake, causes the ash to mix with the molten matter, which cools and forms a clinker when the cold air strikes the mass.

(Continued on next page)

Long Braking Cycles Cause Big "Heat" Damage to Wheels

Thermal Cracks and General Wear and Tear Can Be Lessened by Careful Operation

By S. P. TOBIAS, Wheel Inspector

AMONG the many causes for wheel failures "heat" is one of the big factors. Even if the mixture of the wheel is good, the friction between the rail and wheel, when the wheel is sliding, will ruin the wheel for service and this means a loss to the railroad of $11.14 per wheel.

The wheels under locomotives and cars are made from the largest manufactured product in the world. Cast iron is impure and weak and must be brought to its desired size and form by melting and casting in a mold. While steel is purer than cast iron, and stronger, and may be produced in the desired size and form, either by melting and casting in a mold, or by forging at a red heat.

Much is claimed for all makes, kinds and designs of wheels and whether they fulfill the requirements of actual service it is a well known fact that there is no metal that can withstand maximum braking for any long period of time without causing of thermal cracks, and the shorter braking cycles are less destructive to the wheel than the long braking cycles. In this connection as far skidding, there is comparatively little difference in the amount of metal abraded from the cast iron wheel, and that removed from the steel wheel with this exception, however; if the skidding continues for some distance the steel is the first to yield.

No Fixed Lever Standard

In view of the fact that brake gears are designed at the time the car is built, and on account of the dissimilarity in tare weights, there can be no fixed standard of levers for each capacity of car. It is, therefore, essential that more attention should be given to checking braking power of cars, and as to knowing the co-efficient of friction between the wheel and rail, the only item brought out is that the co-efficient of friction decreases as the load increases, but not different for the cast iron wheel as compared with steel wheel.

If all of the group of things having a tendency to slide wheels, such as improper handling of air or hand brakes, improper designing, or improper hanging of the brake beam, and wheels out of round, were normal, then the bad order triple and piston travel would be responsible for slid flat wheels.

Below is a statement, which is self-explanatory. This statement deals with cause of flat wheels.

We have learned by experience that we have three times as many slid flats during the winter months as in the summer months. Four reasons follow:

1. Wheels not truly round increases the tendency to slide.
2. Improper designing, or improper hanging of the brake beam.
3. Improper handling of the air or hand brakes.
4. The shorter the braking cycle, the less damage is done to the wheels.

Commonly speaking, it is the little things that are overlooked. In other words, we fail to consider the entire group of things and conditions that aid in sliding wheels.

Combustion and Mechanical Stoker

(Continued from Page 37)

Sulphur, aside from its clinker forming tendency, also gives off an objectionable odor, and eats up the fire sheets.

The above is a simple explanation of how the two major elements of coal are burned in their order, so next we will consider the problems encountered in burning these, the volatile and fixed carbon, so that the least percentage of them may be lost through imperfect combustion.

Economy in Mechanical Stokers

The trend of the design of mechanical stokers and of the locomotive in general is such that the greatest economy in fuel may be obtained, as we are all aware of what this item means to the railroad. The amount of coal to be burned to develop the required horse-power is carefully figured and as much evaporating surface exposed to the heat as possible is essential. The amount of oxygen required to burn the requisite amount of coal is figured so that ample grate surface may be allowed, for if the grate surface is restricted, it means that a higher burning rate per square foot of grate surface is required, then it follows that the higher the burning rate, the higher the velocity of the draft to furnish sufficient oxygen must be. A low velocity of the draft is essential for this reason: Only one-fifth of one second of time elapses from the instant the volatile leaves the coal until these gases are eighteen inches inside the flues, and they must be burned completely during this brief time of their intrainment or they are lost, as the temperature drops to about 1,300° or 1,400° F. by the time they are inside the flues in contact with these cooler evaporating surfaces. This is below the igniting temperature and the gases which are not burned before they reach the flues will go out the stack as black smoke. Black smoke is simply finely divided particles of unburned carbon suspended in the gases of combustion. Therefore, it may be seen that the fireman's problem with the volatile is to maintain a thin, level fire, so that the fixed carbon on the grates will be burning as a bright incandescent mass, giving off the maximum possible temperature to quickly ignite and burn the volatile while it passes through the firebox, over the firebed. The purpose of the brick arch is to deflect the gases giving them a longer intrainment through the firebox, and to ignite them from its heat, also to give the suspended particles of fixed carbon, or sparks, a longer chance to burn in the atmosphere of the firebox. Has the reader ever noticed that when the black smoke is rolling in clouds, that if the fire-door is slightly opened, it clears up? Why? Because the fire has an excess of volatile over the amount of oxygen being supplied, and opening the fire-door a trifle supplied the necessary oxygen. Opening the fire-door wide supplies an excess of unheated air which has a cooling effect on the firebox, the same as a hole torn in the firebed by the draft.

Keep Firebed Level

From our analysis, we find that the fixed carbon or coke represents 51.-74% of our coal. This we must burn on the grates and the oxygen for same must be drawn through the grates. Our firebed must be maintained thin, level, and free from holes, so that all the carbon will be consumed, it burns without smoke, with a short white flame, and forcing the fire beyond the capacity of the draft to furnish oxygen through the grates will be indicated by a percentage of unconsumed coke in the ash, the ignition temperature will at the same time be too low for complete combustion of the volatile. Clinkers forming will be indicated by dull, red spots in the fire and the grates should be moved under such spots, or the clinker pulled to the surface at the first opportunity.

In hand firing, it has always been considered the very best practice to feed the fire one shovel at a time, closing the door after each shovel, and firing halves of the firebox alternately, as the time when the fire is hottest is after the volatile has been consumed and the fixed carbon is fully ignited, as this method allows that the unfed side is furnishing the high temperature needed to properly ignite and burn the volatile.

In the design of stokers suitable for general application some division of opinion exists in regard to whether the coal should be spread over the firebed in a constant stream, or in light charges at intervals, to meet the requirements of correct combustion as outlined in the foregoing paragraph. Some of the best authorities on combustion are adherents of each plan. Those preferring intermittent delivery and light charges claim that each charge of coal when delivered and spread over the firebed, has a chance to throw off its gases, and have the fixed carbon ignited, partly completing the process of combustion before the next charge of coal is delivered, and that there is the elimination of a possibility that there may be an excess of volatile gases over the amount of oxygen being supplied. Others contend that the constant stream delivery attains the same result, in that modern designed stokers have a flexible control and the fire may be starved to such an extent that there is no

(Continued on Page 42)