feet in length and 135 feet at the base; 24 feet at the top and is 35 feet high. The spillway is in the center of the dam of concrete construction, 300 feet long and 10 feet deep. The inside of the dam is covered with a concrete apron which prevents the destruction of the dam by the waves.

The filtration plant is in keeping with the plant; and the pumping plant delivers to the city four thousand gallons of water per minute.

Lake Crook is now full of water and something over two thousand acres are covered with four billion gallons of water impounded, which will care for the needs of a city of 75,000 people. The present consumption is about one million and a half gallons per day.

Overhead storage in the city is 850,000 gallons, being supplied by a 20-inch main of cast iron pipe.

Paris has, as one of its principal activities, a municipal abattoir, established in 1909 by Ed. H. McCuistion, then mayor. It was the first institution of its kind so built and operated in the world, and in the short dozen years it has been in operation has served as a model for similar activities, not only in this country, but foreign lands as well. The abattoir is operated by the city, furnishing wholesome meats to the residents, and maintaining a storage department where the farmers store their meat the year around, thus minimizing the old-time losses. About 88 per cent of the meat consumed in the city is slaughtered at this plant, being bought in the surrounding country and in this way a market is provided for the livestock raised by the small farmer.

The whole plant is housed in a one-story wooden building, and the cost when constructed was about $10,000. Some parts, of course, have been rebuilt and late improvements and extensions have been made.

In connection with the slaughtering plant and cold storage, there is an incinerating plant and this has proven its value in many different and useful ways. The refused carcasses are disposed of in this way and all combustible trash, city garbage, dead animals of all sorts and waste of every description is hauled here and burned. This is another reason why the city is so clean, well kept and sanitary.

The curing plant, in connection with the abattoir, is another valuable asset to the city. Though its construction cost an additional, $5,000, the plant has been worth many more times that much in the amount of meat that is cured and kept each year.

The Gibraltar Hotel, Paris, Texas.

In the matter of industries, Paris has made progress. There is located here a box factory, distributing its output over the Southwest and in Cuba; a crate factory with a range of a dozen states; the largest vinegar factory in the world; and one of the largest printing establishments in the State, The Miller Company, making overalls and shirts, with a payroll of 200; one flour mill, two cotton oil mills, a tool handle plant which supplies big Indiana plants, the compress handles cotton from all of Northeast Texas and some from Oklahoma, the ice plant has a big storage plant in connection; and the poultry shipments are looked after by one of the biggest shipping plants in Texas.

In wholesale houses there are three grocers, fruits and produce, stoves and hardware, optical supplies and other smaller lines.

"SO THIS IS PARIS"

And the visitor who steps from the train will find much to delight and surprise.

A VERITABLE PHOENIX

In 1916 Paris was almost destroyed by fire. Today it stands a modern metropolis; a monument to courage and ambition.

Just What Monthly Fuel Chart Means

By J. E. HUTCHISON, Vice-President in Charge of Operation

The chart which accompanied Mr. Kurn's article in the March number of the Employes' Magazine showed two graphic lines, one indicating the 1923 fuel performance in each class of service, the other line the goal we are striving to reach in 1924. Each succeeding number of the magazine has also shown the record, by months, for 1924, and with the current issue we have before us the result for the six months' period ending June 30th compared with the 1923 record for the same period and also as compared with the goal set for each division in each class of service.

It has been most interesting and gratifying to observe how nearly these anticipated standards have been met. It will be seen for the first three months of the year the lines of the goal set and the actual performance diverged considerably—that is, that we were not able to reach the mark set. This principally due to the unusually cold weather in these months as compared to December, the month in which we established our standard, and which caused our fuel consumption to increase and the train load to decrease in spite of our best efforts, but with milder weather and intensive work on the part of all officers and employes, each month in the second quarter of the year we have been very close to our standard for the system. Some divisions have even been better than the standard. We are very hopeful that in the remaining period we cannot only reach the mark set for each month in each class of service for every division but gain the ground lost in the first part of the year.

What does our accomplishment thus far in 1924 mean? It means that we have handled one thousand gross tons of freight, including weight of car and contents, with an average of 211.97 lbs. of coal as compared with 253.12 lbs. for the same period in 1923. in passenger service our consumption per passenger car mile has been 17.11 lbs. of coal compared with 19.64 lbs. same period 1923. Our consumption in switch service has been 147.53 lbs. of coal per switch locomotive mile as compared with 176.60 for same period 1923. This saving on the part of our engineers and firemen, and all other interested employes, has given us more money for improving our equipment, track and facilities, and I am sure all of you who have had a part in it will agree that the effort has been worth while and that it has given us a better railroad.

One thing that influences our fuel record perhaps more than anything else is the average weight of freight trains in freight service and the number of passenger cars per locomotive mile in passenger service. The character of our service and the grade line of our divisions handling the larger per cent of our traffic, prevents the Frisco from handling trains as heavy as many of our neighboring roads, and it is therefore very important to watch this feature of train loading very carefully. Naturally the number of cars per train mile in passenger service is fairly well established but there is considerable opportunity for improving our freight train haul if this matter is carefully followed up by all concerned. It is very important to watch this feature closely every day and for every train, to insure, so far as possible, giving each engine the maximum load without overloading it.

Fuel economy is, of course, only one of many important details of operation that must be given consideration. Overtime, passenger trains on time, arrival of scheduled freight trains at destination on time with shipments in good order, and many other things are equally important if we are to secure and maintain our share of competitive business, and all these things have a direct bearing on the fuel record.

I read with much interest each month the published copies of the Superintendents' Fuel Meetings, as well as minutes of the other meetings, and I want to take opportunity through these columns to express appreciation for the many good suggestions that are continually being made in these meetings by employes in the various departments, as well as for the splendid articles on Fuel Economy and kindred subjects that are being published. The writing of these articles should not be confined to the officers. Our conductors, engineers, firemen, trainmen, yard and office employes can and will, I am sure, if properly encouraged, contribute articles equally interesting and instructive.

In observing the record of attendance at the fuel and other meetings I have been just a little bit disappointed that more of our train and yard men, and also our train dispatchers, have not found it convenient to attend these meetings as frequently as some of the other classes of employes. These men come in to such intimate contact with conditions that bring about waste of fuel, either directly or indirectly that it would be very helpful indeed for the division officers to have the benefit of their suggestions.

Perhaps we have not been persistent enough in encouraging the attendance of these men at these get-together meetings which are merely informal discussions and cannot help but be fruitful of results when conducted along the methods that are now being followed.

Details of ways and means for improving our fuel performance and thereby reaching our expected goal of an average reduction for the year 1924 of 12½%, have been outlined in previous articles by various officers and employes who are in very intimate contact with the problem, and I hope we will have very many more suggestions of this nature.

It is unnecessary to repeat or dwell upon these methods but I do want to emphasize the importance of team work in this and all other operating problems. In no other vocation in life is team work more necessary than in railroad service and it is particularly so in train and locomotive operation. To make the Frisco Railroad the really successful, prosperous institution that we are all equally interested in having it, requires the very best we can give of heart and hand and brain. I know the Frisco Family and I know what their layalty and interest and hard work has meant in making it the splendid property it is, one of the best railroad properties in America or elsewhere. We need only a continuance of that spirit to enable us to reach any standard of performance we aim at.

Some Fuel Records

July 12th—Engine 1315, train No. 136, Springfield to Ft. Scott, 166,824 Gross Ton Miles, used 9 tons of coal or 107 pounds per 1,000 G. T. M.

June 22nd—Engine 1,052, train No. 112, Afton to Kansas City, 1,870 car miles, used 1,165 gallons of oil which is equivalent to 9 pounds per passenger car mile.

Month of June—Engine 361 in switch service in Paris, Texas yards, Engineer Fry, Fireman Ringgold, worked 241¾ hours, consumed 8,769 gallons of oil, 168 gallons oil being equal to one ton of coal, this is equivalent to 71 pounds of coal per switch locomotive mile.

June 28th—Engine 1,306, extra south, Ft. Scott to Springfield, Engineer Phelps, Fireman Beal, 163,904 Gross Ton Miles, consumed 8 tons of coal or 98 pounds per 1,000 G. T. M.

July 12th—Engine 1,282, extra north, Amory to Memphis, Engineer J. Strader, Fireman Bonner, 215,191 Gross Ton Miles, consumed 11 tons of coal or 102 pounds per 1,000 G. T. M.

June 13th—Engine 1,064, train 105, Amory to Carbon Hill, Engineer Bernard, Fireman L. Johnson, 576 passenger car miles, 4,440 pounds of coal or 7.7 pounds per passenger car mile.

April 5th—Engine 1,067, train 105, Amory to Carbon Hill, Engineer Madden, Fireman Jones, 576 passenger car miles, 5,340 pounds of coal or 9.2 pounds per passenger car mile.

(Continued on page 14.)

Amount of Heat Liberated in Firebox Determined by Oxygen Burned

By W. A. REESE

THERE seems to be a general crusade among the railroad employers and employes on the different railroads the last few years on the economical use of fuel, and the railroad officials, no doubt, are in a position to show up a remarkable saving, which has been brought about by a general co-operation of those whose duties bring them in contact with one of the most expensive items connected with railway operation.

When one takes time to think of the enormous amount of fuel used to operate railroads, it is worth while in this connection to pause a moment and think of the number of men who are offered an opportunity to show an individual saving, for, after all, it is the individual effort combined which enables the railroad officials to look upon the final result with pride.

To be economic in the use of fuel, from the engineer's point of view, means to pull the fixed tonnage by the use of the least possible amount of heat, and from the fireman's standpoint, means to furnish the required amount of heat by the use of the least possible amount of fuel; since heat is the one and only source of power in the locomotive.

All of the fuel oil and coal placed in a locomotive firebox is put there to produce heat, which in turn is imparted to the water to generate steam, but we should bear in mind that it's from the heat in the steam, and not from the steam itself that we get power. Therefore, any loss in heat, either before or afterwards imparted to the water to generate steam, or any loss of steam, either directly or indirectly, is an absolute waste of fuel.

All of our heavy trains are started and kept moving by the heat liberated in the firebox, the amount of which is determined by the amount of oxygen we burn, and not by the amount of fuel used. If this be true, it follows that we should endeavor at all times to bring about a condition in the firebox which will enable us to burn just as much oxygen as possible, and with this in view the article is written, and, may I add, that oxygen is the only natural element furnished to railroads without a tax.

Now the question arises, what is oxygen, where is it found in its free state, and under what condition may we use it?

Oxygen is one of the permanent gas elements, and as far as we know has been with us since the creation of all things. It is mixed in with another gas element known as nitrogen. These two elements mixed together mechanically constitute our atmosphere, which reaches to an unknown height. The higher we go, the lighter it is. The bulk of the atmosphere, however, may be found within a layer of two and one-half miles from the earth.

On account of the increased cost of last year's coal bill to railroad companies of $300,000,000 will perhaps jump to $375,000,000 this year.

Considering last year's coal bill, at least 25% of $75,000,000 worth of fuel was accounted for in firing up and was consumed by locomotives during their idle period, standing about, and am sorry indeed that the heat losses through safety valves alone, opened unnecessarily during these periods, could not have been kept track of. I fear the heat wasted at this point would even startle the unconcerned.

It is pretty hard for one to estimate the amount of coal this amount of money represents. As a matter of information, if this amount of coal was placed in ordinary coal cars, coupled together, it would make a train in length of 23,000 miles, approximately. Pretty nearly enough to reach around the world. The amount of fuel used by railroads, understand, is only a part of the fuel consumed annually for other purposes. With this information we are able to fully appreciate the enormous drain financially on your company's treasury. Facing this fact, it seems to me that every employe on the Frisco would well pause and look with deep concern toward the fuel crusade. Bigger men than you or I are looking toward future generations and wondering what will become of the people should the alarm go off, "the fuel is exhausted."

The hope for higher efficiency along the lines of economy lies within the management's ability to bring about a general co-operation. There is nothing which will tend to stunt the ambition of one who is endeavoring to save so quickly as the sight of one who is needlessly wasting.

We should think about fuel, talk about fuel, attend fuel meetings, and express our thoughts, if in our opinion they will tend to prevent waste. Hold nothing back. Throw all the light you can, in front of all the people you can, whenever you can, and in so doing, we more fully justify our existence as a part of the railroad company to which we belong.

In the fifth paragraph of this article, it is claimed that the amount of heat in a firebox is determined by the amount of oxygen burned. Now the question comes up, how does the oxygen reach the firebox?

Bear with me a moment and we will thrash it out. It is not pulled in, I assure you, but is simply pushed in—keep this in mind.

Draft in a locomotive firebox is the result of reducing the air pressure above the fuel bed to a point below the pressure underneath. This is brought about by the exhaust steam, creating in the smoke box a very slight vacuum, so very slight that it is measured in ounces and not in pounds, and for this reason officials who are in authority should never allow a locomotive to leave a terminal with either a steam or air leak in the front end, since it does not require much of a leak to destroy the slight vacuum.

On engines where the front ends are perfectly tight, and properly drafted, this vacuum created by the escaping steam usually runs from ten to fourteen ounces. The vacuum can be filled but from one source, namely, the air in the flues and firebox, which prior to the engine's exhaust, was practically at the same pressure as that in the front end and ash pan.

Now, as the air in flues and firebox rushes into the front end to fill the partial vacuum, the air in the ash pan tries to force its way through the fire to replace it, or in other words, to maintain a balance, and in so doing brings in the oxygen necessary to burn the fuel. This is what is termed draft, and it only requires a difference of from two to four ounces above and below the fire to produce this draft. Now, then, if this be true, it follows that the slightest steam or air leak in the smoke box will tend to destroy our draft, and for this reason, also, ash pans should be put up in such a manner as to allow atmospheric pressure at all times, and under all conditions to be present below the grate line. The free air openings in the ash pan should be large enough to accommodate the large volume of air required to burn coal properly. Locomotives would steam better without ash pans.

The diaphragm and draft plate has nothing to do with creating the draft, they are placed in the smoke box for the purpose of distributing the draft, that is, to give direction to the path of the gases in their passage from the flues to the stack, and in doing this, to aid in keeping the front end clear of cinders. If the draft is properly distributed, each flue and every square foot of the grate surface will perform its duty. These two items are among the compelling factors that determine the amount of heat produced in the firebox.

(To be continued in the next issue)

Roadmaster Tells How To Renew Bad Ties

By R. HOLLAND, Roadmaster, Neodesho, Kansas

IN THE renewing of bad ties one should proceed as follows:

The ballast should be removed from between the ties, or the two ties as the case may be, that are to be replaced to a depth just slightly below the bottom of the old tie, which is to come out. After this is done the spikes should be pulled from the old tie and it should be knocked into the trench where the ballast has been removed and the tie pulled from the track. The new tie should be inserted in the same trench and slipped back on the old bed and if possible without disturbing it.

The disturbing of the old tie bed, which has become solid through years of use, is very damaging and undesirable. In the first place the foreman in charge of the work should carefully inspect the ties ahead, locating enough bad ties for one day's work, and in distributing the ties with his push car should figure on the thickness of the ties that are to be renewed and also of the ties which are to be inserted. This is very important with reference to the proper spacing of new ties, as one inch or one and one-half inches in the width of a tie makes considerable difference in spacing where one is renewing ties. It also works vice versa, because the thickness of the tie necessitates a greater disturbance of the old bed. The subject of disturbing the track while renewing ties is one that requires the deepest thought on the part of all section foremen and roadmasters, and I am certain after a foreman or roadmaster has tried it, he will never deviate from the above method.

In all cases the ties should be carefully examined before they are removed from the track; the foreman should satisfy himself that he is not removing a single tie that will last twelve months or more. Ofttimes a tie that will hold up the same weight as a new tie will not hold gauge of track, but by placing a new tie on either side, it will last for twelve months or longer. The use of the tie plug prolongs the life of this sort of a tie.

There is nothing so damaging to a roadbed or track as the digging out of the roadbed formed by long years of mechanical tamping and it leaves the track in a condition where it will go out of surface and out of line on account of the old bed being disturbed, which cannot be wholly restored by tamping. It is impossible after a roadbed has been dug out to tamp a new tie up solidly at the first tamping, and on account of this we

are apt to have wavy track where we allow the old bed to be disturbed in tie insertion.

I have noticed with most all ballast I have handled that the use of the jack for jacking up the track so as to pull out the old tie with but little or no digging is not practical, and I am very much opposed to the practice of using jacks while inserting ties. When the track is jacked up more or less of the ballast runs which will raise the track and hold it up to such an extent that when new ties are put in it leaves the track in a wavy condition. If the track is out of surface it should be put to good true surface and levelled up and all of the ties tamped up with the exception of ties that are to come out. These ties should be pulled out and new ties slipped in and tamped up and in cases of this kind, only, in renewing ties should jacks be used. In my opinion, the raising of the track every time that ties are renewed is wrong. When enough ballast has been placed underneath the ties to hold the track to fair surface, additional ballast should not continuously be put in, as the most difficult piece of track to handle is a track that is up high on ballast with little or no shoulder, and a track in this condition is the hardest on which to maintain good surface or line. Fifteen per cent more ties can be inserted by the digging-out method as against the use of jacks, in chatts, gravel or cinder track.

Another feature that is important in handling of track is the gauging on the old ties that remain in the track to conform to a standard gauge on the new ties which have been inserted. A great many foremen in renewing ties fail to bring their track to a true gauge on the old ties that are left in the track, and on account of this the new ties are hardly ever spiked to exact gauge; and when the track is handled in this manner it is impossible to secure good, true line and surface. In the absence of good true gauge and good true line, it is an impossibility to secure a good riding track.

The tie renewals are not handled properly by very many foremen. The proper inspection and testing of ties before renewals is not done thoroughly; ties are not distributed ahead with push car as they should be; oftentimes ties are handled by hand, several rail lengths, to get them to the point of insertion. All this causes unnecessary expense.

Excessive mechanically worn ties or "rail-cut" ties should not be left in the track. When ties become mechanically worn so that they are so thin under the rail that spikes go through regardless of condition of the timber, a dangerous condition exists; as these worn ties, together with canted rail, which they are largely responsible for, are very likely to, and do cause rail breakage.

I would like to hear from some roadmaster who has had more experience than I, as to whether or not his methods agree with mine.

Perhaps This Really Should Be on the Homemakers' Page

Springfield, Mo.,

Miss Loretto A. Connor,
St. Louis, Mo.

Dear Sister:

How many of you sisters have a few jars of yellow ground cherry preserves in your collection of fruit for this winter? I, for one haven't, but I have a few seeds for the coming year, and in the fall of 1924 I hope to have enough seeds to exchange for other seeds with you, sister readers.

The yellow ground cherry is a native fruit of the western soil, and can be grown nicely in this territory, but the seeds are awfully hard to get. Seeds of the ground cherries are planted from year to year, just as you would plant tomatoes, then transplanted from beds. They grow in a pod and fall from the bush when ripe. They should be picked from the ground. To preserve, hull, wash and add a little water and plenty of sugar. There is nothing better—a fruit that no one turns down.

By the way, sisters, I have started a friendship silk quilt. How many sisters will send me a scrap of silk, just any size. To each one from whom I receive a scrap of silk, I will send in return a package of pretty, mixed flower seeds.

Yours respectfully,
MRS. JAS. L. HOPPER,
R. 11, Box 367-A,
Springfield, Mo.

Frisco at Ft. Smith Defeats the Jobbers' Team

Results of a ball game played on the Oklahoma side. After a late start the Frisco trimmed the Jobbers in a four-inning battle, score 6 to 3, game called on account of darkness.

Team	1	2	3	4	5	6	7	8	9	R	H	E
Frisco	3	3	0	x	x	x	x	x	x	6	6	2
Jobbers	3	0	0	0	x	x	x	x	x	3	3	2

Batteries—Frisco: Allen and Hickerson; Jobbers: Tinder and Grace. Umpire Cochran.

Struck out by Allen 4, by Tinder 6.