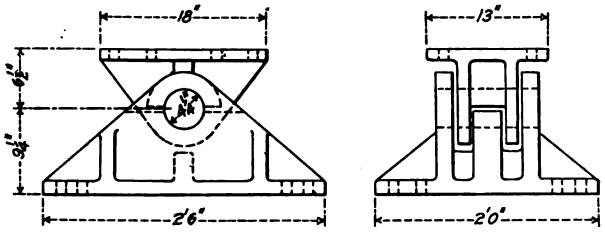
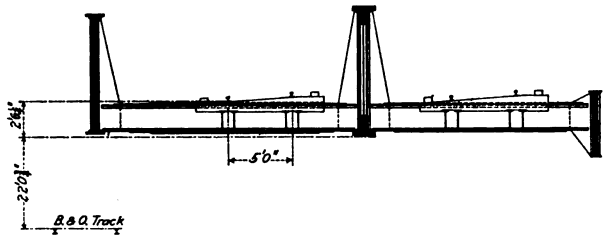
the bend or the bridge seat has a slotted hole measuring 2¼ in. by 6 in. in it, as shown in the engraving of the hinge bend of the Salisbury viaduct. This permits of a lateral adjustment, while the washer is slotted in the other direction in the same manner so that the bolt can be moved 2 in. in any direction; or, in other words, there is a freedom of motion of 4 in. to allow for any inaccuracies that may occur in the setting of the



Cast Steel Shoe for Rocker Bent.

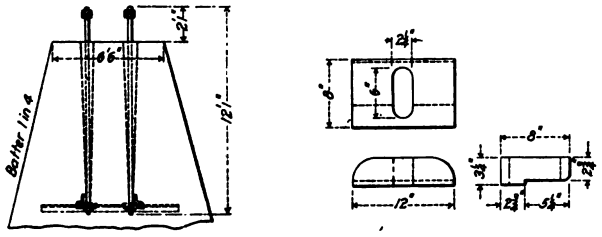
bolts. After they have been sprung into their proper position, the hole about them is grouted and they are rigidly fixed.

The construction of the line is being done under the administration of B. F. Bush, president, who has had large experience in heavy railway construction in the west and northwest, and



Cross Section of Bridge Over Baltimore & Ohio Tracks.

A. Robertson, vice-president and general manager, whose jurisdiction extends over the construction. The execution of the work is under the immediate charge of H. R. Pratt, the chief engineer of the company, who is responsible for the whole work, the character of which is indicated by these details and outline of the general engineering features, which will thus be seen to be



Anchor Bolts and Cast Steel Cap.

that of a high-class modern railway construction, such as has only become possible in recent years because of the advances that have been made in methods of work, and which would have been out of the question a generation ago. The Carter Construction Company, Chicago, John B. Carter, president, has the contract for the entire line. A. W. Jones is the chief engineer of the Carter Construction Company.

For 15 years the Russians have had an establishment in the Crimea for preserving ties by soaking them in sea-water. At present some 300,000 ties yearly are so treated. The ties are soaked three or four months, each absorbing from 9 to 11 lbs. of salt. They are said to do best in hot and dry districts, where they last about two years longer than untreated ties—not nearly so long as creosoted ties; but the process is much cheaper.

LOCOMOTIVE SMOKE IN CHICAGO.*

BY PAUL P. BIRD.

Chicago is the greatest railway center and one of the largest manufacturing centers in the world. Soft coal from Illinois and Indiana is used, but this coal is difficult to burn without making smoke and dirt. For years it has been an open question as to how much of the total smoke of Chicago was made by locomotives. It is often stated by railway officials that the railways make a very small proportion of the total smoke, and that from a standpoint of smoke prevention the electrification of railway terminals is unwarranted. During the last few months the department of smoke inspection of Chicago has made an investigation to determine the proportion of the total smoke made by the railways. The result of this study may be summarized as follows:

SUMMARY OF CONCLUSIONS.

Although the locomotives use only 18½ per cent. of the total coal, they make 43 per cent. of the total smoke and over one-half of the total dirt.

The locomotives consume within the city limits 5,600 tons of soft coal daily, or about 1,850,000 tons annually.

According to the Ringlemann system of judging the density or blackness of smoke, the average density of locomotive smoke in Chicago is 23 per cent.

Because smoke from locomotives carries with it large quantities of sparks and cinders, such smoke is a greater dirt producer than smoke from stationary plants.

Although locomotives make 43 per cent. of the total smoke, because of the character of the smoke they produce over one-half of the the total dirt traceable to smoke.

The lowest average density of smoke produced by any one road is about 10 per cent. This figure probably represents as low an average as can be maintained with steam locomotives using soft coal.

If all locomotives in Chicago maintained an average smoke density as low as 10 per cent., the locomotive smoke would still form 29 per cent. of the total smoke and probably produce over one-third of the dirt.

Locomotives in the neighboring towns outside of Chicago make an average smoke density of about 41 per cent., showing that the anti-smoke campaign in the city has already reduced the smoke nearly one-half.

Approximately 10 per cent. of all coal fired in a locomotive firebox is discharged from the stack in the form of cinders. Within the city limits of Chicago about 560 tons (14 carloads) of cinders from locomotive smoke-stacks are dropped every day.

There are about 2,200 miles of railway track in the city limits. At all times there are about 1,400 different locomotives working in the city, and during a week as many as 3,740 different locomotives are in Chicago.

CLASSES OF SMOKE MAKERS.

In making a study of the different ways in which the total smoke of Chicago is made, the smoke makers of the city have been grouped into seven different classes, as follows:

Central District.—This class includes all stationary boiler plants in the district bounded by Chicago avenue, Twenty-second street, Halsted street, and Lake Michigan, and is composed chiefly of office buildings, hotels, wholesale and warehouse buildings, factories, etc.

Miscellaneous Power Plants.—This includes all stationary high pressure boiler plants except those in the central district. In this group are placed factories, mills, manufacturing buildings, electrical power plants, packing houses, breweries, gas manufacturing plants, pumping stations, school houses, hotels, hospitals, laundries, etc.

Flat Buildings.—This includes all low pressure steam-heating plants in flat or apartment buildings, family hotels, etc. No

* Abstract of a paper read at a meeting of the Western Society of Engineers, Chicago, February 15, 1911.

private residences or buildings having three or less flats are included.

Domestic Heating.—This includes all private residences, cottages, two and three flat buildings, etc., which use soft coal, principally in stoves.

Special Furnaces.—These include all special furnaces used in various manufacturing processes other than steam boiler furnaces, such as heating and melting furnaces in steel plants, terra cotta plants, malleable iron plants, forge shops, enameling plants, annealing ovens, baking ovens, china kilns, etc.

Locomotives.—This includes all steam-railway locomotives used in the city limits.

Boats.—This includes all steam vessels used in the city limits, such as tugs, passenger, freight, excursion and canal boats, pile drivers, dredges, etc.

COAL CONSUMPTION.

The smoke department estimates that 10,000,000 tons of bituminous coal are consumed in Chicago annually. This figure may be taken for the year 1910 and includes semi-bituminous or Pocahontas coal. From 1893 to 1906 a record was kept of all coal shipped into Chicago and all coal shipped away. It showed that in 1906 the consumption was about 8,000,000 tons. A curve drawn through the points obtained by plotting this record for the thirteen years between 1893 and 1906 shows that a gain of 2,000,000 tons from 1906 to 1910 is consistent and probable. A check on this total figure of 10,000,000 tons has been obtained by accounting for its use by the different consumers of soft coal.

Central District.—This class is estimated to use 1,500,000 tons of soft coal annually. This figure has been obtained by making a careful census of the boilers and by considering figures obtained from coal dealers. It is estimated that 1,125,000 tons of Illinois and Indiana coal are used in this district and about 375,000 tons of semi-bituminous coal. This semi-bituminous coal is used in the low pressure plants.

Miscellaneous Power Plants.—The coal used by the plants in this class has been obtained by making the following computation: The records of the boiler department and smoke department show that there are about 7,000 high pressure boilers in the city and that the average rated boiler horse power is about 143. A study of the load conditions in hundreds of plants shows that the average load is about 75 per cent. of the installed boiler capacity. With these figures the following computation is made:

Number of high pressure boilers in the city	7,000
Average rated horsepower per boiler	143
Total capacity in horsepower of high pressure boilers	1,000,000
Average load, per cent. of rating	75 per cent.
Number of days per year that average plant is in operation	300
Number of hours per day that average plant is in operation	10
Average pounds of coal used per boiler horsepower per hour	5
Then it follows that the	
Total tons of coal used per year in all stationary high pressure boiler plants is	5,625,000

According to the classification of plants, this 5,625,000 tons is the annual coal consumption of the low pressure plants and the high pressure plants. The high pressure plants have been estimated to use 1,125,000 tons annually, which leave 4,500,000 tons of coal as the annual consumption of the miscellaneous power plants.

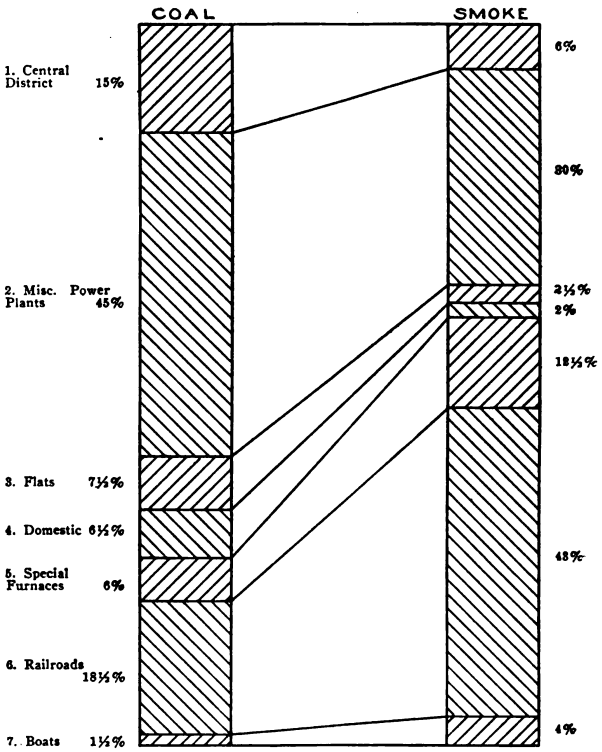
Flat Buildings.—These plants are estimated to use 750,000 tons of coal per year, most of which is Pocohontas coal. This figure has been obtained by getting the number of such buildings in Chicago and estimating the average coal consumption per building. There are probably from 1,000,000 to 1,200,000 tons of semi-bituminous coal used in Chicago annually.

Domestic Heating.—The coal used for domestic heating is difficult to estimate, and 650,000 tons of soft coal annually is as close a figure as is obtainable. This has been arrived at by getting figures from coal dealers and by estimating the number of consumers.

Special Furnaces.—These are estimated to burn 600,000 tons of coal per year. This is based on figures obtained from a number of the largest consumers.

Locomotives.—The coal used by locomotives has been accurately estimated. The smoke department wrote to all the railways asking for estimates of coal burned by locomotives in the city limits. The returns show a total of 5,601 tons. This is the average for week days. Assuming that the Sunday consumption is one-third of the week day consumption, and that the other holidays in the year do not affect the average, it follows that the annual coal consumption of steam locomotives in the city limits is 1,850,000 tons.

Boats.—These are estimated to use 150,000 tons per year. This figure has been obtained by getting estimates from most of the companies operating vessels in the rivers.



Percentages of Total Smoke and Total Coal Burned in Chicago.

The division of the 10,000,000 tons is therefore as follows:

Consumer.	Annual Consumption. Tons.	Per cent.
Central district	1,500,000	15.0
Miscellaneous power plants	4,500,000	45.0
Flats	750,000	7.5
Domestic	650,000	6.5
Special furnaces	600,000	6.0
Locomotives	1,850,000	18.5
Boats	150,000	1.5
	10,000,000	100.0

DENSITY OF SMOKE.

Knowing the coal consumption of these different classes of plants, it requires a knowledge of the average density of smoke made by each class to arrive at the percentage of the total smoke made by each. For this purpose the department has used the Ringlemann method of estimating the relative blackness or density of smoke. This system was invented by Prof. Ringlemann, of Paris, and is in general use throughout the world. The U. S.

Geological Survey has adopted it as a standard. The Ringlemann method of judging smoke is clearly explained in the transactions of the American Society of Mechanical Engineers, Volume XXI, December, 1899. Using this method of computing the percentage of density, the smoke department has arrived at the following results:

SMOKE DENSITY BY RINGLEMANN CHART METHOD.

Consumer.	Percentage of Density.
Central district	3.75
Miscellaneous power plants	6.5
Flats	3.0
Domestic	3.0
Special furnaces	20.0
Locomotives	22.3
Boats	25.0

that the cleanest place was at the Illinois Central tracks and Van Buren street, where the average density was 10.5 per cent. Locomotives of the Wisconsin Central occupy the first place with an average density of smoke of 10.76 per cent. The Chicago Junction Railway occupies the lowest position in the list with an average of nearly 42 per cent. The average percentage of locomotive smoke density in the two months' investigation is 22.3 per cent.

DIVISION OF TOTAL SMOKE.

Knowing the amount of coal burned in the city by each of the seven classes of consumers and the average density of the smoke made by each class it is an easy matter to compute the total amount of smoke made by each class. As far as known this is the first attempt ever made to sub-divide the total smoke of a

No	RAILROAD COMPANY TRUNK LINES	MILES OF TRACK IN CITY LIMITS			LOCOMOTIVES									COAL					
					AVERAGE NUMBER IN CHICAGO AT ONE TIME			TOTAL NUMBER OF DIFFERENT LOCO'S IN CHICAGO DAILY			TOTAL NUMBER OF DIFFERENT LOCO'S IN CHICAGO WEEKLY			TONS PUT ON ENGINES IN CHICAGO DAILY			TONS BURNED WITH IN CITY LIMITS DAILY		
		MAIN	SIDE	TOTAL	PASS.	FREIGHT	TOTAL	PASS.	FREIGHT	TOTAL	PASS	FREIGHT	TOTAL	PASS.	FREIGHT	TOTAL	PASS.	FREIGHT	TOTAL
1	A.T. & SANTA FE R.Y. CO.	13.28	43.82	57.10	10	24	34	10	24	34	19	35	54	52	158	210	25	75	100
2	BALTIMORE & OHIO R.R.	16.14	25.67	41.81	5	20	25	10	32	42	10	32	42	65	195	260	19	56	75
3	CHICAGO & WESTERN INDIANA R.R.	50.32	99.71	150.03	3	—	3	3	—	3	3	—	3	30	55	85	30	55	85
4	CHICAGO & ALTON R.R.	14.22	32.60	46.82	5	19	24	10	29	39	10	29	39	85	232	317	9	134	143
5	CHICAGO BURLINGTON & QUINCY R.R.	11.34	80.17	91.51	20	73	93	41	73	114	59	100	159	150	300	450	50	215	265
6	C & O R.R.CO. OF IND. FORMERLY C.C.&L.	—	—	—	2	3	5	2	3	5	2	3	5	12	21	33	1	6	7
7	CHICAGO & EASTERN ILLINOIS R.R.	—	—	—	8	12	20	12	13	25	12	13	25	19	58	77	24	52	76
8	CHICAGO GREAT WESTERN R.R.	—	16.01	16.01	4	12	16	5	20	25	5	20	25	32	100	132	15	48	63
9	CHICAGO INDIANAPOLIS & L'VILLE RY.	—	—	—	4	3	7	6	5	11	6	5	11	—	8	8	4	10	14
10	CHICAGO IND. & SOUTHERN R.R. CO	—	—	—	2	2	4	3	4	7	3	4	7	18	32	50	1	8	9
11	CHICAGO MILWAUKEE & ST PAUL R.Y.	54.66	103.01	157.67	18	76	94	34	96	130	56	145	201	172	598	770	49	457	506
12	CHICAGO & NORTHWESTERN RAILWAY	66.89	234.34	303.23	135	188	323	135	188	323	135	188	323	500	1500	2000	264	786	1050
13	CHICAGO ROCK ISLAND & PACIFIC R.Y.	95.94	76.99	112.93	17	17	34	33	27	60	222	166	388	52	158	210	88	118	206
14	ERIE RAIL ROAD	—	—	—	4	9	13	6	14	20	11	34	45	43	70	113	11	73	84
15	GRAND TRUNK RAILWAY SYSTEM	17.04	26.25	43.29	4	16	20	8	25	33	8	25	33	53	137	190	20	60	80
16	ILLINOIS CENTRAL RAIL ROAD	143.00	167.63	310.63	67	81	148	70	106	176	70	106	176	502	400	902	300	200	500
17	LAKE SHORE & MICH. SOUTHERN R.Y.	11.42	73.85	85.27	22	43	65	26	48	74	181	324	505	180	383	563	78	231	309
18	MICHIGAN CENTRAL RAIL ROAD	7.58	42.60	50.18	5	18	23	15	20	35	15	20	35	44	131	175	22	68	90
19	NEW YORK CHICAGO & ST LOUIS R.R.	8.70	29.51	38.21	4	22	26	6	25	31	6	25	31	35	112	147	10	55	65
20	PENNSYLVANIA RAILROAD CO	89.72	164.19	253.91	19	126	145	35	153	188	245	1071	1316	80	567	647	80	567	647
21	PERE MARQUETTE RAILROAD	—	—	—	5	4	9	8	2	10	52	3	55	30	20	50	10	20	30
22	WABASH RAILROAD	9.84	28.68	38.52	3	18	21	10	18	28	10	30	40	60	140	200	15	75	90
23	MINN. ST.P & S. STE M RY LESSEES OF W.C	—	—	—	6	9	15	6	9	15	6	9	15	—	6	6	13	39	52
	BELT OR TRANSFER RAILROADS																		
1	B & O CHICAGO TERMINAL R.R.	33.93	50.77	84.70	2	23	25	2	23	25	2	23	25	19	57	76	25	75	100
2	BELT RAILWAY OF CHICAGO	32.24	66.36	98.60	—	82	82	—	82	82	—	82	82	—	425	425	—	425	425
3	CHICAGO JUNCTION RAILWAY	5.80	4.20	10.00	—	37	37	—	37	37	—	37	37	—	296	296	—	296	296
4	CHICAGO RIVER & INDIANA R.R.	—	—	—	—	4	4	—	4	4	—	4	4	—	32	32	—	32	32
5	CHICAGO UNION TRANFER RY.	—	—	—	—	1	1	—	1	1	—	1	1	—	—	—	—	2	2
6	CHICAGO WEST PULLMAN SOUTHERN RR	—	—	10.00	—	10	10	—	10	10	—	10	10	—	40	40	—	40	40
7	CHICAGO & CALUMET RIVER R.R.	2.19	.10	2.29	—	2	2	—	2	2	—	2	2	—	6	6	—	6	6
8	ELGIN JOLIET & EASTERN R.Y.	3.52	15.73	19.25	—	45	45	—	45	45	—	45	45	—	121	121	—	121	121
9	INDIANA HARBOR BELT R.R.	10.25	—	10.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10	ILLINOIS NORTHERN RAILWAY	12.25	—	12.25	—	5	5	—	5	5	—	5	5	—	24	24	—	24	24
11	MANUFACTURER'S JUNCTION R.Y.	—	1.16	1.16	—	3	3	—	3	3	—	3	3	—	9	9	—	9	9
12	UNION STOCK YARDS	17.31	129.37	146.68	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	TOTAL	669.58	1512.72	2192.30	374	1007	1381	496	1140	1636	1148	2593	3741	2223	6391	8624	1463	4438	5601

Miles of Railway Track, Number of Locomotives and Amount of Coal Burned by Them Within the City Limits of Chicago.

An important part of the investigation of the density of smoke in Chicago has been a study of the smoke made by locomotives. During October and November, 1910, a special observer spent his entire time on the rights of way of the railways in the city limits. During these two months he made over 11,000 separate observations and watched the locomotives of 30 different railways. The observer was assigned each day to a certain point on the right of way of some road, often at a junction of two or more roads, his instructions being to watch every locomotive coming within his sight, and to record in his memorandum book the number of minutes during which he watched the engine and his estimate of the density of the smoke in accordance with the Ringlemann charts. It is probably unnecessary to say that this work was done with absolute impartiality and that no effort was made to watch the engines of one road more than another. The results show that the dirtiest place in Chicago was at Fifty-fifth street and the Chicago & Western Indiana tracks. This point is also at the south end of the Erie yards. The average density observed was 45.4 per cent. Similarly, the list shows city among the various classes of plants responsible for its production. The work has been done carefully and accurately, and it is felt that the results obtained are very nearly correct.

Consumer.	Annual coal consumption. Tons.	Per cent.	Smoke. Percentage of density.	Percentage of total smoke. As figured.	Round numbers.
Central district	1,500,000	15.	3.75	5.85	6
Misc. power plants	4,500,000	45.	6.5	30.45	30
Flats	750,000	7.5	3.0	2.34	2½
Domestic	650,000	6.5	3.0	2.06	2
Special furnaces	600,000	6.	20.0	12.5	12½
Locomotives	1,850,000	18.5	22.3	42.9	43
Boats	150,000	1.5	25.0	3.9	4

OUT OF TOWN OBSERVATIONS.

During the month of December, 1910, the same observer who had worked in Chicago on the investigation of locomotive smoke was sent to eight different towns outside the city limits to make similar observations. The density of smoke averaged 41 per

cent. This is probably a fair figure for the performance of a locomotive using Illinois or Indiana coal with no particular attention paid to preventing smoke. Streator, Ill., had the smokiest locomotives, 361 observations averaging 51 per cent. smoke density. This indicates the results of the anti-smoke campaign in Chicago. It shows that outside of the city, where no effort is made to prevent it, the smoke is nearly twice as dense as in Chicago. This is true of the stationary plants as well as the railways. If the citizens of Chicago will compare their city with other cities in the middle west they will find that, plant for plant, locomotive for locomotive, chimney for chimney, Chicago is the cleanest of all.

CHARACTER OF LOCOMOTIVE SMOKE.

Locomotive smoke carries with it quantities of sparks and cinders, while in stationary plants relatively little of such material is thrown out. This is because of inherent features in the design that are unavoidable. On a locomotive there is so little room available that the grate surface of the boiler is necessarily small and consequently a powerful draft is necessary to do the required work. This draft is obtained by discharging the exhaust steam from the engine cylinders up the stack. Because of this strong draft great quantities of fine coal and ash is drawn out of the firebox with the smoke, which in turn are discharged from the stack in the form of cinders. From 8 to 18 per cent. of all bituminous coal put into locomotive fireboxes escapes from the stack in this manner. In Chicago about 5,600 tons of coal are burned in locomotives each day. Assuming that 10 per cent. of the coal leaves the stack in the form of cinders, it means that 560 tons of cinders are thrown into the air and dropped on the city of Chicago every day. This is equal to about 14 carloads. On the other hand, in stationary plants where there is plenty of room for a larger grate surface and where the coal is burned with a lower draft and with tall chimneys, but few cinders are carried out with the smoke. Therefore the smoke from locomotives on account of carrying with it sparks and cinders is far more objectionable than the smoke from stationary plants, and as it is discharged into the atmosphere at no great distance from the ground and is trailed over long courses, it is safe to say that from the standpoint of a nuisance the steam locomotive is the worst offender of all. The investigation shows that the locomotives of Chicago make about 43 per cent. of the total smoke. Considering its character, the conclusion seems warranted that steam locomotives produce over one-half of the dirt traceable to smoke.

POSSIBILITIES OF LOCOMOTIVE SMOKE PREVENTION.

The lowest percentage of smoke density made by the locomotives of any railway was 10.7 per cent. Probably 10 per cent. is as low an average as can be maintained with steam locomotives using soft coal. Therefore the very best condition that can be hoped for in Chicago is to have all locomotives average 10 per cent. density, which would mean that the locomotive smoke would still be 29 per cent. of the total, and probably be responsible for over one-third of the dirt. The modern steam locomotive is such a highly developed machine that it is extremely unlikely that any change will ever be made in its construction which will produce better results than this. A further reduction of the smoke made by locomotives can only be brought about by change of fuel. The possible fuels besides the local soft coals are semi-bituminous coal, anthracite coal, coke and oil. A considerable amount of semi-bituminous or Pocahontas coal is now being burned by some of the railways in Chicago, and although it makes less smoke than Illinois coal under the same conditions, its use by no means guarantees the entire elimination of smoke. Probably the universal use of semi-bituminous coal would not succeed in reducing the average density of smoke below a point that is considered possible with Illinois coal. The general use of anthracite coal or of coke for locomotives would eliminate smoke, but the other nuisances due to steam locomotives would not be diminished. If coke were used there would be an increase in the quantity of sparks and cinders discharged from the stacks. In either case the volume of furnace gases and their effect in vitiating the atmosphere would not be reduced. Fuel oil makes smoke unless carefully handled, and the smoke that is made is more objectionable than the smoke from soft coal. It is probable that if all locomotives in the city burned oil, the smoke and gases would form more of a nuisance than the soft coal smoke of today. The general use of any specially selected fuel would greatly increase the cost of fuel to the railways, and the practical difficulties involved would make it a very difficult thing to bring about. The locomotive fireboxes would have to be changed if coke or hard coal were used. In order to ensure that all locomotives operating in the city limits used the same fuel, all the engines on an entire division would have to be thus equipped, which of course would greatly increase the cost of operation.

ELECTRIFICATION.

The study that has been made indicates clearly that electrification offers the only final and satisfactory solution of the locomotive smoke problem. The use of special fuel for preventing smoke on steam locomotives is only a makeshift and will not satisfy the public.

A NEW RAILWAY LAW IN CALIFORNIA.

The California legislature has passed the Eshleman railway bill, drafted by Railroad Commissioner Eshleman, Governor Johnson, Senator Stetson, Attorney-General Webb, Assemblyman Gogswell, railway commissioners Loveland and Gordon and W. R. Wheeler and Seth Mann, of Merchants' Exchange Traffic Bureau, San Francisco. The bill became a law February 15. The important sections of the law are as follows:

Sections 1 to 5.—Provide for organization of the commission as it now exists, adding an attorney at $5,000 a year; to give to the commission and persons in its official employ the right of free transportation in California when on official business; provide for meetings to be held monthly at San Francisco and such other places and times as may be necessary.

Section 6.—Provides for contempt proceedings to enforce the commission's orders.

Section 7.—Provides for the issuance of process by the commission to compel attendance of witnesses and production of books and papers.

Section 16.—Empowers the commission to establish rates for the transportation of freight and passengers; to prescribe rules and regulations for demurrage; for services in connection with transportation; for the classification of freight; to establish through rates; prescribe joint rates and the division of rates or fares on joint rates; prescribe the construction and maintenance of tracks to connecting lines; and the regulation of crossings.

Section 17.—Provides for a record of rates established by the commissioners; rules as to admissibility of evidence; that railways shall be given 20 days' notice of proposed action by the commission upon any rate.

Section 18.—Provides that within 30 days after the act goes into effect railway companies shall file tariffs, and that the commission shall, within 60 days thereafter, establish or suspend the same unless the commission shall assign any such rates for investigation, giving the companies concerned notice and opportunity to be heard; that companies shall be provided with tariffs affecting them; companies are required to have tariffs printed and posted.

Section 19.—Provides that rates shall remain in effect until changed by the commission; on the first day of July, 1912, and annually thereafter, companies may file proposed changes of schedules, which shall be acted upon by the commission as upon an original filing of rates; if the commission has investigated any such within six months it need not have a hearing; intervention is allowed on a showing of interest in the subject matter