# Trains

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## Fifty million Frenchmen can't be wrong about a 4-6-4

"Nowhere in the world was the art of steam locomotive desig

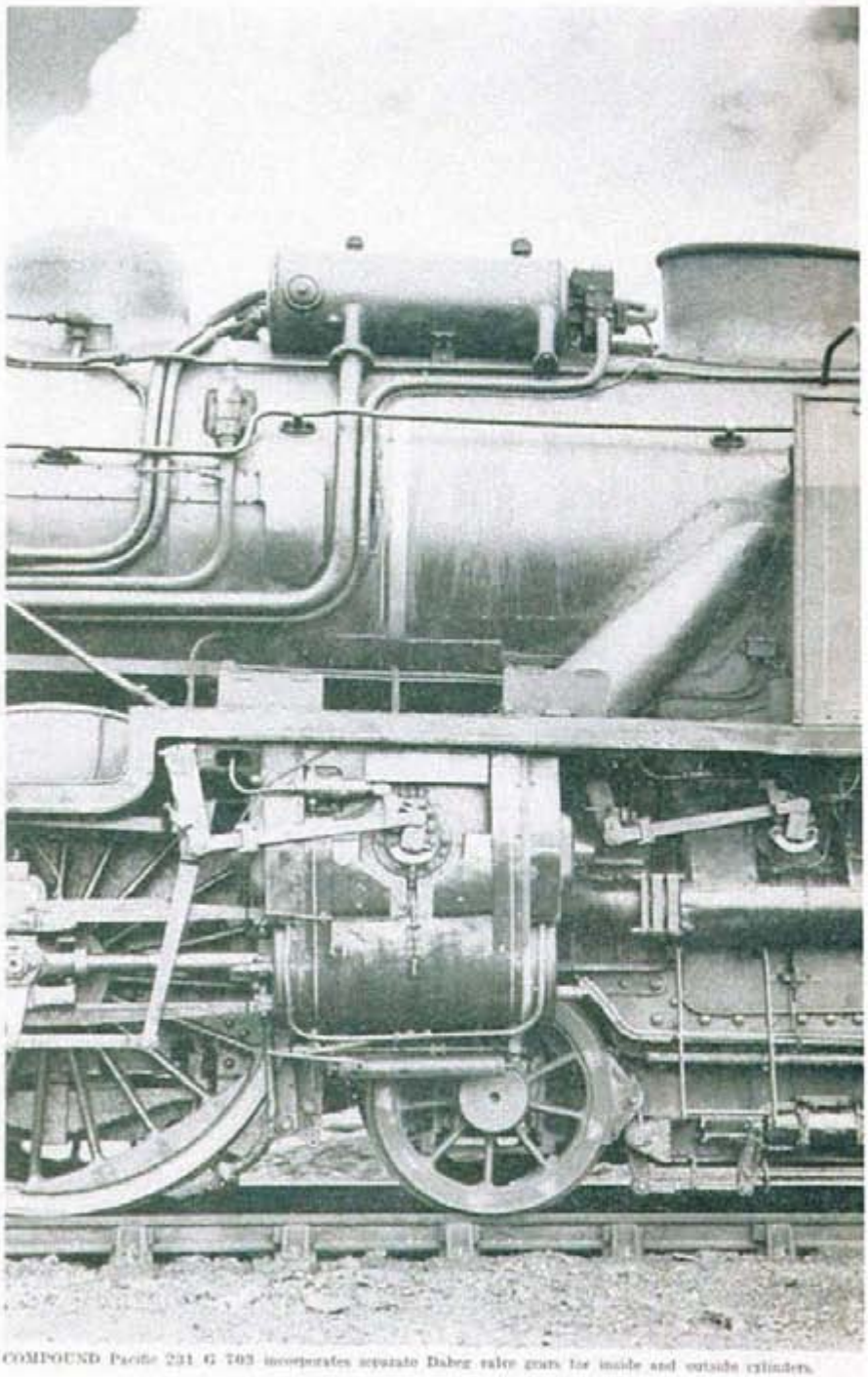
R. K. EVANS

photography / THE AUTHOR

IT MARCH 28, 1955, marked the end of an era on the railroads of Europe. For on that spring morning the quiet of the Landes, the vast, silent salt marsh of southwestern France, was shattered by the passage of an unscheduled train: a long green-and-gray electric locomotive with a few specially selected coaches whose only passengers were technicians. On board the crew members and engineers watched tensely as ammeter and speedometer needles crept round their dials, as the arrow-straight track ahead unwound ever faster and the Gothic catenary arches blurred into invisibility.

As the elegant machine whirled its test train past the magic 200 mph mark and into the headlines, a startled world realized that France had entered a new era of railroad superiority. For though engineers and railfans will long argue the relative merits of Big Boys and Challengers, of Central Hudsons and Nickel Plate Berkshires, the fact remains unquestioned that nowhere in the world was the art of steam locomotive design developed as far and as close to perfection as in France.

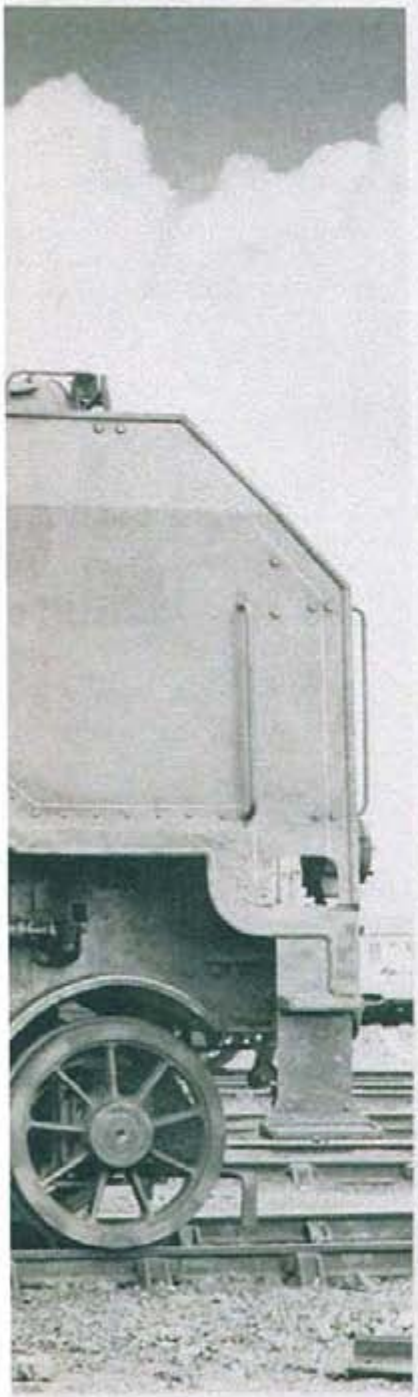
Even today — more than 10 years after CC 7107's still-unsurpassed 205 mph guaranteed that the world rail-speed record would remain on Gallic soil (sister engine 7121 had achieved the then record of 155 mph a few months earlier) — the sound of steam can still be heard, albeit faintly, beneath the broad skies of France. But its day is drawing to a close. The few main lines not electrified are beginning to echo to the chant of Sulzer and M.G.O. diesels, and any visitor from this side of the Atlantic will be quick to spot the familiar products of La Grange and Eddystone where once the distinguished lines of their steam predecessors proclaimed Belfort or La Courneuve as their birthplace.



COMPOUND Pacific 231 G 703 incorporates separate Dabeg valve gears for inside and outside cylinders.

# THE CASE FOR THE FRE

veloped as far as in France"



BEFORE turning the clock back to the beginning of this last great decade of steam, let's take a quick look at France's railroad history. More important, let's see how railroad development was dictated by the geography of a country which stretches from the gray North Sea to the limpid Mediterranean, from the Alps in the east to the sandy beaches and rocky headlands of the long Atlantic coast. Like Spain, France is a square land, and its principal railways radiate from the capital, Paris, like a 10-pointed star. Few cross-country lines were built; still fewer exist today, when a cross-country journey by branch line and bus may take almost as many days as a trip on the vastly longer route via the capital takes hours.

A century ago the railway builders had laid their main routes, and the transport map had begun to look as it does today. The coal- and iron-rich northeast, with its profitable traffic interchanges with the then Prussian empire, prospered from the beginning — so much so that the provinces of Alsace and Lorraine were annexed by the Prussians in 1871 and remained part of Germany until after the First World War. German operating practices still characterize railroading in this section of France.

Elsewhere the economy was largely rural. Rail competition was avoided to a great extent by a decree that goods between two points must take the shortest route. As early as 1863 government-allotted "areas of concession" had led to the emergence of six principal companies — the Est, Nord, Ouest, and Paris-Orleans, all based on Paris; the Midi, which controlled the frontier entrances to Spain at both ends of the Pyrénées but extended only as far north as Bordeaux and, farther east, the deserted uplands of the Massif Central; and largest of all, the Paris, Lyon & Mediterranée — one of Europe's great railroads, the quintessential *grande ligne* marching 700 miles southeast from Paris to the sea and the Italian frontier.

Nationalization — of a sort — came early to the French railroads. Soon after the war of 1871 several of the secondary lines came under control of one Simon Philippart, a European Jay Gould who came to a spectacular financial crash. One of the bankrupt roads, the Compagnie Secondaire de Charentes, was taken over by the government and re-emerged in 1878 as the Etat, the French State Railway.

Meanwhile, though the Nord and Est systems continued to profit from their coal traffic and favorable ties with the rest of Europe, lines in the west and south found the going financially precarious. The Ouest particularly began to acquire a reputation for financial failure and general laxity. Cartoons of "cornfield meets" of the period invariably depicted locomotives prominently labeled OUEST. (To compound its problems, the Ouest was also saddled with the smallest loading gauge — its tunnels were still being opened out as recently as 1960.) So in 1909 the state took over this system too, creating a larger Etat network covering the whole of Western France. It is over the steeply graded Etat main line to Paris that the transatlantic visitor, newly disembarked at Cherbourg, makes his first acquaintance with French steam power today.

True nationalization took place in 1938. In that year the five major companies remaining (following an amalgamation four years earlier between the Paris-Orleans and the Midi) were taken over by the Société Nationale des Chemins de Fer Français — the French National Railways, or SNCF. In their place were formed five Regions, corresponding geographically with their parent companies: the Eastern and Northern regions tallying almost exactly; the Western Region reviving the title lost to the Etat 29 years earlier; and the South-Western Region replacing the amalgamated PO-Midi. Fifth and largest of the new regions was the South-Eastern, combining the great PLM with those eastern lines of the Midi which linked it to

# ICH STEAM LOCOMOTIVE

## The French count axles, not wheels

UPON nationalization in 1938, the newly formed SNCF inherited the rolling stock of five highly individualistic companies, each with its own classification and numbering system. Bringing order out of chaos took some years; but by the end of World War II a comprehensive numbering system had evolved for all the remaining steam classes. Each region was allotted a number — Est 1, Nord 2, Ouest 3, Sud-Ouest 4, and Sud-Est 5 — and within each region the various designs were classified chronologically and by axle arrangement. Thus Pacifics became 231 A, 231 B, 231 C — and so on, according to their date of introduction.

Naturally many classifications were duplicated. Class 231 D, for example, applied to three different designs on three regions; on the Sud-Ouest they were 1921-vintage Baldwins. Since few locomotives stray across regional boundaries, little confusion arises.

Class letters to and including P were reserved for locomotives designed new for the SNCF. Unlike prenationalization types, these were of standard designs suitable for the entire system. The 141 P class Mikes of 1941, for instance, may be found on all five regions. The ubiquitous U.S.-built 2-8-2's, of which many hundreds still exist today, became Class 141 R. These two classes will probably be the very last steam engines to disappear.

Identification of French motive power, despite the apparent failure to differentiate between similar types, is simple. The cast brass or steel cabside number plate includes the full engine number; above it are regional number and the depot d'attache — the engine's home shed. Thus the number plate of the ex-Etat Pacific on which I traveled from Cherbourg to Paris read "RATIGNOLLES. 3-SNCF. 231 G 703." In addition, the regional and locomotive numbers appear prominently across the front buffer beam.

In 1962 a further classification was evolved, consisting of a two-digit code number for each of the 72 steam classes still running. Though they were principally intended for accounting and record purposes, the new code numbers have been painted on the cabside below the existing number plate. Codes run from 62 (Nord 231 C) to 89 (Nord 141 TA) — passenger locomotives first, then freight, and finally tank engines; codes 95 to 99 are reserved for oil-burning variants.

Spain. Shortly after the war this southern extremity became Region 6, the Mediterranée, with headquarters in Marseilles.

Since the war, too, the railways of France have undergone changes more drastic than at any time in their history. War damage and reprisals against the *Résistance Fer* toward the end of the Nazi occupation gave the SNCF an unrivaled opportunity to re-equip with new rolling stock, new trackwork and signaling. The decision was made to electrify much of the route-mileage which before the war had been scheduled for several more years of steam operation. Most pre-war electrification and that carried out until the early 1950's used 1500-volt direct current; but as is well known, France pioneered the large-scale adoption of 25,000-volt A.C., and most of its subsequent electrification has been on this system. The last few years have seen the completion of some three-quarters of the planned electrification; and as the remaining services are gradually being turned over to diesel traction, the number of steam locomotives in use has fallen to less than 3000.

LET's turn the clock back to the golden summer of 1959, when the main lines through half of France still throbbed with the wheels of Mountains and Pacifics, when streamlined Hudsons sped their international expresses north to the Belgian frontier, and the valleys of the Ardennes and the Vosges were blackened by the smoke of coal-burning 2-10-0's. That dry, sun-filled autumn of 1959 — one of Europe's few and long-remembered Indian summers — was one that I shall long recall for another reason. During that August and September I traveled the length and breadth of France on board steam locomotives of every type, from World War I Consolidations working out their days on local freight to 10-year-old 4-8-2's handling top-flight expresses.

Seven years ago transatlantic air travel had yet to do more than skim the cream from ocean liner traffic. Americans in large numbers still set foot on French soil at Cherbourg rather than at Orly, and well-filled boat trains tested the track capacity of Cherbourg's modern station. Few trunk routes in France demand such strenuous locomotive work as this 230-mile Etat main line. It was a surprise to walk to the head of the heavy 13-car train meeting our boat and find, not the modern eight-coupled machine one would expect, but a Pacific dating in its original form from the early 1920's. The neat cast plate on the cabside read "231 G 703 — REBUILT 1947."

There, in capsule form, is the story of a search for perfection in steam locomotive design unmatched in Europe. For even while electrification was under way, those responsible for the SNCF's motive-power policies realized that steam would be in harness for some time to come and that rather than let it suffer the slow and unsung death of U.S. steam power, more would be achieved by maintaining it in peak condition until the end. So this gleaming, well-polished Pacific was representative of a breed of machine seldom encountered on this side of the Atlantic — not always of the latest design, but modified and rejuvenated with every aid to thermal efficiency available.

Forerunners of G 703 and her sisters were a class of four-cylinder compound Pacifics built for the Paris-Orleans in 1912 — capable locomotives for their day, provided they were not overextended. Then in 1929 the master hand of André Chapelon, at that time Chief Engineer of the P-O but destined to become one of the great locomotive engineers of all time, guided their rebuilding into highly efficient machines embodying Lentz oscillating-cam poppet valves, extra-large steam inlet and exhaust passages, and a high degree of superheat.

The improvement was phenomenal. Power output was raised from 2100 to no less than 3500 h.p., and news of the achievements of the 4-6-2's, both on trial and in normal service, soon spread beyond the confines of the P-O. In particular the accounts attracted the attention of Raôul Dautry, who, on becoming manager of the Etat at the end of the war, had found an aging motive-power fleet hard-pressed to handle the postwar traffic surge. Soon after the Chapelon rebuilds had entered service on the P-O, therefore, Dautry instructed the Etat motive power department to study these engines and embody their new features in almost 300 rundown four-cylinder compound Pacifics. Only minor details,

such as Crampton fireboxes in place of Belpaire, distinguished these from the original P-O engines; modifying them on Chapelon's principles appeared fairly straightforward.

In 1933 rebuilding commenced. Thirty-unit Schmidt superheaters were fitted; steam passages to the high-pressure cylinders were enlarged and the low-pressure cylinders were provided with Dabeg poppet valves. Altogether, 134 locomotives were treated; most are still in service as Class 231 D. Although their performance was much improved, the quest for even greater efficiency continued. The next step was to modify a further 23 machines with Willoteaux double-port slide valves and 6 with Renaud poppet valves. The former are now Class 231 F; the latter, rebuilt yet again with Lentz valve gear, became 231 E.

Experiment seemed unceasing. Over the next 15 years 30 locomotives were completely rebuilt with high superheat, enlarged steam passages, double chimneys, and Dabeg poppet valves on all four cylinders. They are still in service, like our G 703, as class 231 G. Eighty-two similar rebuilds, except for retaining their original low-pressure cylinders, became Class 231 H; and finally, in 1937 there appeared the solitary 231 J 523, a unique three-cylinder simple-expansion machine with Renaud-Marty valve gear.

Even though the writing was on the wall for French steam power, the search for improvement went on until well after the Second World War. Now, in 1959, 231 G 703 belied her age as I climbed up into the spotless cab and was greeted by the crew. *Mécanicien* Hainville and *Chauffeur* Vernier were both from the "top link" at Batignolles, where G 703 was stabled. Both were in their late 30's; and Hainville, as befitted his responsibility for this boat train working, was a graduate of one of the SNCF apprentice training schools, with a three-year grounding in workshop technique and locomotive maintenance. G 703 was his "own" engine, driven only by him and maintained under his direction until complete overhaul was necessary — generally after some 180,000 miles.

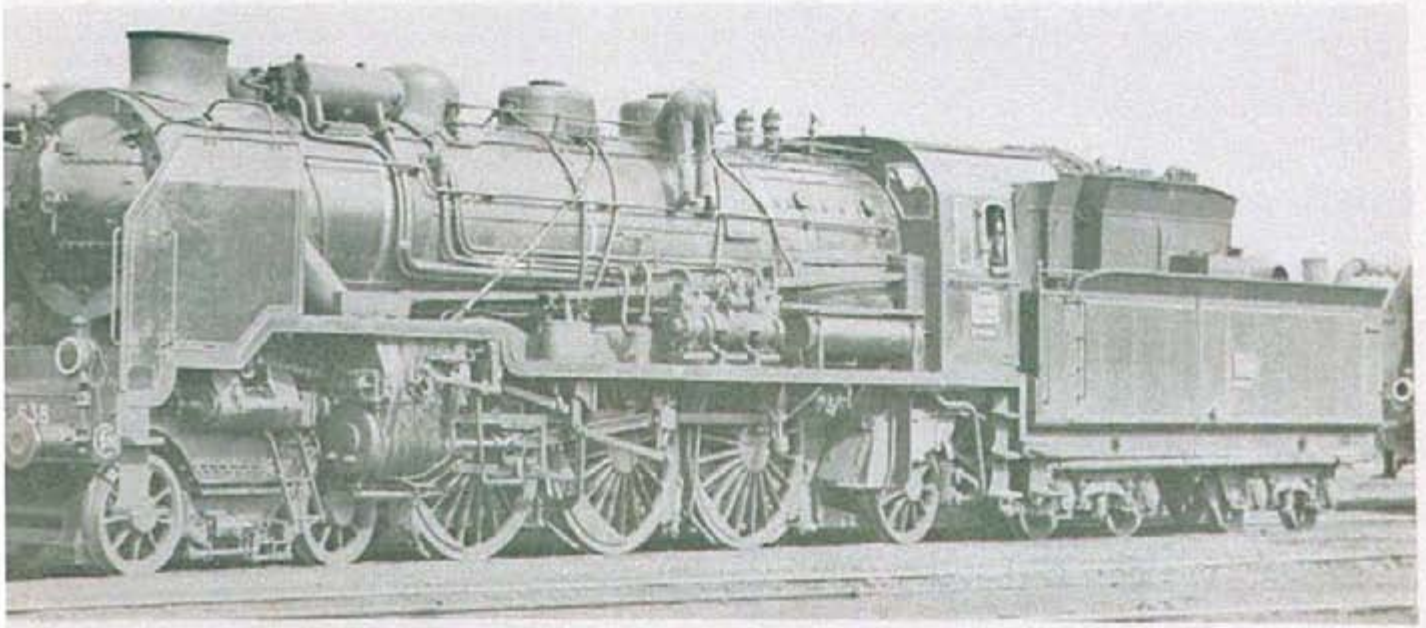
Introductions were made, and in the few minutes remaining before departure time Hainville proudly showed me around his charge. From ground level the Walschaerts-operated Dabeg valve gear looked complex. As in the original de Glehn compounds, and all but the most modern SNCF power, the two sets of gear are separate and can be linked up independently. Another feature unusual on this side of the Atlantic was the leading truck brakes operated by small cylinders midway between each pair of wheels. By European standards, G 703 was not a large machine; weighing a little over 100 long tons, she would have been dwarfed by some of the more modern German Pacifics or even by a Stanier "Coronation." But size is not the only criterion, as I was soon to see.

After climbing on board once more, Hainville kept close watch for our departure signal — the green-and-white metal *guidon* held aloft by the stationmaster far back down the platform. Four minutes late we got the "right away." Despite the low adhesion factor (only some 57 tons are carried on the coupled wheels), slipping was nonexistent. Abetted by the very soft, almost inaudible exhaust, this belied the fact that a 625-ton train was snaking over the switches behind us.

As in most of France, running is on the left — a reminder that the builders and engineers of these northern lines were the men who had pioneered Britain's early railroads. There was little time to study the intricacies of French trackwork, for only a few yards from the platform end began the long 1 per cent climb to Couville summit, 7 especially taxing miles for a cold engine. Vernier's careful preparation of the fire had paid off; even so, his shovel was seldom at rest as speed crept up to 40 mph. My notes tell the story: "Both sets of valve gear about 60 per cent, regulator full open. Riding good — compensated springing, of course."

Seldom, indeed, did I find the riding of SNCF engines anything but exemplary. A high standard of track maintenance and impeccable locomotive condition combined to make my notebook a paragon of legibility — far from the case when footplating in Britain or the U.S.A. On board G 703 only the slight horizontal movement between engine and tender marred the otherwise perfect riding as we climbed the long sweeping curves through Martinvast. Here ran the German lines during the final days of the Nazi occupation. It was not difficult to picture the scene as it must have been 15 years earlier: the enemy in their emplacements along the ridge, withstanding the American assault until their final withdrawal, demolishing as they went the trackage we were now traveling.

Rounding the final curve into the



*Leading-truck brakes are another characteristic of these compound 4-6-2's.*

summit cutting, speed had dropped to 35 mph. Here the saw-toothed track profile became apparent. Ahead of us stretched 8 miles of equally steep downgrade, a signal for Hainville to close the regulator about one-third and wind the high-pressure reversing gear back to some 30 per cent. This, I discovered, proved to be the usual driving method on these modified Pacifics; speed was controlled by cutoff rather than by throttle opening. The two sets of valve gear may be altered separately or locked together and operated as one. The latter procedure was generally followed on my journeys, and indeed, more modern machines had no provision for doing otherwise. A separate throttle controls the admission of high-pressure steam direct to the low-pressure cylinders, but only once did I see such reinforced compound operation — on a Chapelon ex-P-O Pacific with a heavier train.

On G 703, this 30/60 per cent cutoff ratio saw us quickly accelerate to the permitted maximum of 75 mph. Woe betide any French driver who exceeds the speed limit in his enthusiasm to make up lost time, for examination of the Flaman recorder chart is made after each run. Correspondingly, time-keeping bonuses are highly valued in France. At least the Flaman was easily observed; not half hidden beneath the fireman's seat — its usual place of repose on Gresley's record-breaking A4's — but immediately ahead of *Mécanicien* Hainville below the front cab window. Beside it, in a plastic-fronted frame, he had hung the working timetable. Clearly this train, the leading boat train of three, could brook no delay.

*Chauffeur* Vernier took up his shovel again in anticipation of the long climb facing us after passing Lisons, which we swept through at an undiminished 75 mph. The next 25 miles, prior to the steep descent into Caen, had scarcely 2 consecutive miles at the same gradient; yet speed remained between 65 and 75 throughout, with the reassuring sound of the train control equipment heralding each distant signal — one blast for "off," two if it was "on."

After the mile or so of level track through Caen was behind us, climbing began in earnest: 45 miles of predominantly 0.8 per cent grade, with only one brief "breather" shortly beyond de la Motte tunnel. Clearly, Vernier was an expert with the shovel, and for the next 40 minutes he had little respite. For the first time I saw G 703 fully ex-

## A trace of narrow gauge

WHAT of the narrow gauge in France? Thirty years ago one could have traveled by rail from the Channel coast, say, to within sight of the Mediterranean and barely have touched the lines of the major companies. Today the once-vast network of private track stretching more than 15,000 miles across the length and breadth of the country is reduced to a handful of meter-gauge tentacles operating, in most cases, under sentence of death. Even the lines scheduled for "modernization" under the postwar *Plan Monnet* are worked largely by autorails — Renault and Billard and Décauville railbuses of boneshaking discomfort.

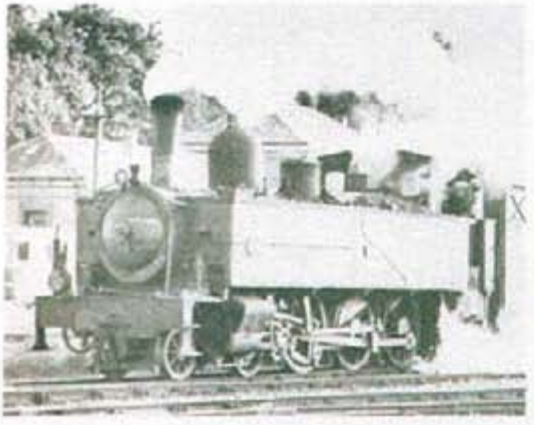
Yet steam is to be found, elusive though it may be. Far and away the largest of the remaining secondary systems is the Réseau Breton, with 244 miles of meter-gauge track serving the rocky, Maine-like Brittany peninsula. In the 1930's nearly 1200 meter-gauge miles formed one network in this sea-girt northwest corner of France. The Morbihan and Finistère systems failed to survive the war, and even the 270-mile Chemins de Fer des Côtes-du-Nord ran its last train in 1959. But for 60 years the Réseau Breton has been administered, not with the limited funds of a *département*, but by the state-operated Société Generale des Chemins de Fer Economiques, now a subsidiary of the SNCF.

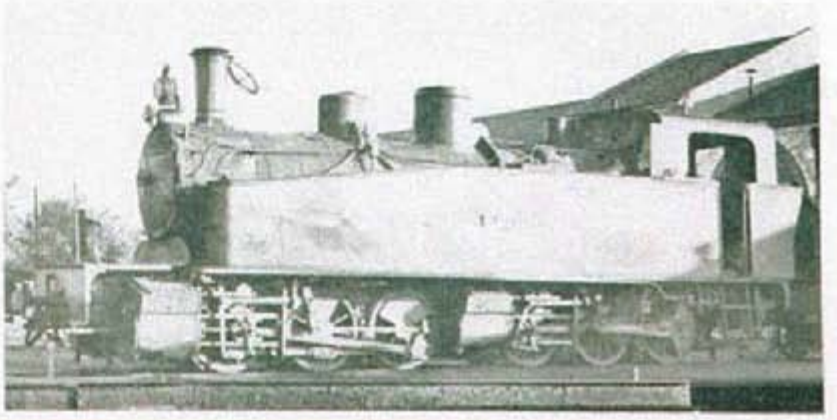
So unlike most of the private narrow-gauge railways, whose once prolific trackwork was of the lightest and whose locomotives proved a frequent source of inspiration to artists drawing comic postcards, the Réseau Breton laid its trackwork with 50-pound bullhead and included in its motive power big 4-6-0 and 0-6-6-0 Mallet tanks, which are still on the roster.

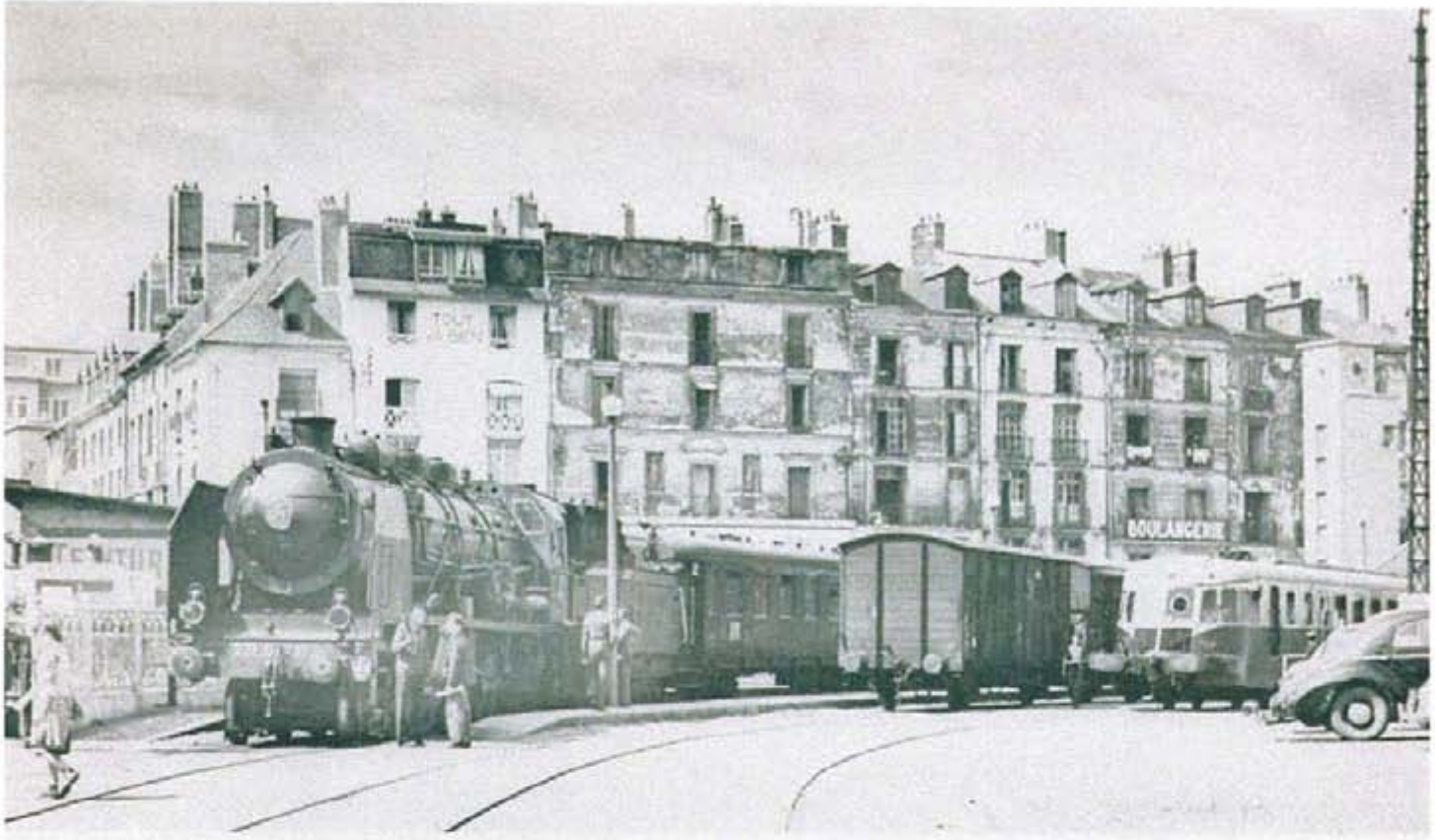
Five principal routes, all single track, radiate from the busy RB station at Carhaix. Over three of them — to Morlaix, Guingamp, and Rosporden — frequent autorails connect with the SNCF Western Region expresses to Quimper and Brest. A fourth branch, beyond Loudéac to la Brohinière, caters to freight traffic only; and the fifth, extending 60 miles through wild and windswept Finistère, ends at Camaret-sur-Mer, most westerly railhead in France.

Freight traffic on all these lines is in the hands of eight 55-ton 0-6-6-0 tanks (below, right), genuine Mallet compounds built by Piguet in 1913 and renowned ever since as the most powerful narrow-gauge steam engines in the country. On the la Brohinière branch is another 0-6-6-0 Mallet of checkered history. No. 41 was built in 1913 for the long-defunct Chemins de Fer du Centre, which operated around Roanne and Vichy, and was subsequently bought by the Tramways de l'Ain. In 1938 this line closed too, and the Mallet fell into the hands of the Chemin de Fer du Blanc à Argent, in Touraine. In 1948 dieselization of the Le Blanc line caused the 0-6-6-0's transfer once more, this time to the P-O Corrèze system in the hills of the Massif Central. Even this was not to be No. 41's final home. She proved too heavy for the light Corrèze track and in 1953 was bought by the Réseau Breton.

Passenger traffic on the RB is operated principally by autorails of various vintages, including three 24-ton Décauvilles built for the Yunnan line in northern Indo-China. At busy periods they are augmented by mixed trains, and for these the RB maintains 12 fine green 4-6-0 tanks (below, left) built by Société Franco-Belge and Compagnie Fives-Lille between 1904 and 1909. Eight trains daily leave Carhaix behind these smart meter-gauge tanks. I








*Paris boat train ready to depart Dieppe Maritime behind Etat 231 D 731.*

tended — throttle wide open, cutoff close to 65 per cent, and steam temperature steady at about 690 Fahrenheit. For the first time, too, the exhaust became audible from the tender fall plate where I stood, each beat distinguishable as speed diminished to 45 mph. Outside, dusk was falling over the apple orchards of Calvados. Hainville switched on the cab lights as we pounded into the tunnel, then took over the shovel from Vernier, squinting beneath it occasionally as he built up the front corners of the fire to his satisfaction.

As I was to find on subsequent trips, firing a French locomotive is a pleasure compared with performing the same task on British counterparts: largely a corollary of the former's superb riding qualities. The very short cabs, common on all but the largest types, help by eliminating that extra step between shovel plate and firedoor. The firedoor itself is in three sections, hinged at the top and opening inward — a vastly simpler arrangement than the usual sliding door or "butterfly" variety — and on G 703 its self-closing action was of obvious value as we pounded upgrade inside the tunnel, each exhaust beat accompanied by a fierce rush of flame back over the brick arch.

Once clear of the tunnel Vernier opened the blowdown valve, a procedure to be carried out for 30 seconds every 50 kilometers (31 miles), according to a notice above the firedoor. Few French locomotives employ continuous blowdown, though water quality can best be described as "mixed." Continuous water treatment, however, is commonplace — usually on the Armand principle — and boiler washout takes place every two weeks.

On the brief length of falling grade from the tunnel to Lisieux our speed rose to 70 once more; but the respite was short-lived, for immediately beyond the station the 0.8 per cent climb resumed. Ahead the signal lights shone reassuringly green; inside the cab the comforting glow of the gauges was dimmed by the glare from the firebox as Vernier shoveled steadily — two scoops to the front corners, four to the back, then a few seconds pause before bending to it again.

St. Marde-de-Fresne marked the summit. Now began a series of switchback swoops, up and down in close succession as far as Evreux. Here we took water; even though speed was reduced to 40 mph over the troughs, the long scoop lever called for both men to apply all their weight to withdraw it before all three of us were drenched. Another summit beyond the two tunnels at St. Aubin, then 10 miles descent before the final 10-mile 0.8 per cent climb to Breval. The hard work was over — we were approaching the Seine now and the final 45-mile stretch of water-level route into Paris.

The junction at Mantes, with the heavily trafficked line through Rouen from Dieppe and Le Havre sweeping in on our left, saw us reduce speed to 20 mph. The station clocks showed 7:54. We had covered the 195 switchback miles from Cherbourg in 3 hours 40 minutes — commendable indeed for a basically pre-World War I machine hauling a 625-ton train.

Through Achères we rolled steadily. At our present mile-a-minute gait ample time remained for an on-time arrival in Paris, and I remembered that it was here, 60 years earlier, that a speed of 60 mph was first reached by a motor vehicle on the open road — Camille Jenatzy's electric-car record of 1899.

The four tracks widened into six, and soon into eight. Vernier hosed down the footplate for the last time as we swung over the burrowing junction with the suburban electric tracks. On our right lay Batignolles shed, where G 703 was stabled, and ahead of us the long, deep cutting leading beneath the Place de l'Europe and into Gare St. Lazare. Hainville had closed the regulator; carefully he made successive, light brake applications as we swung alongside the platform, and exactly at 8:30 p.m. by the big station clock we came to a stand. My two-month *Tour de France* had made an auspicious start.

MANY of the pleasures awaiting one in Paris have no place in this story;

## Genius of steam:

## André Chapelon

I ANDRÉ CHAPELON, generally regarded as one of Europe's greatest living engineers, is undoubtedly the world's foremost authority on the steam locomotive. Chapelon was born in 1892 and saw distinguished service as an artillery officer in World War I before commencing his railroad career with the PLM, which he joined in 1919.

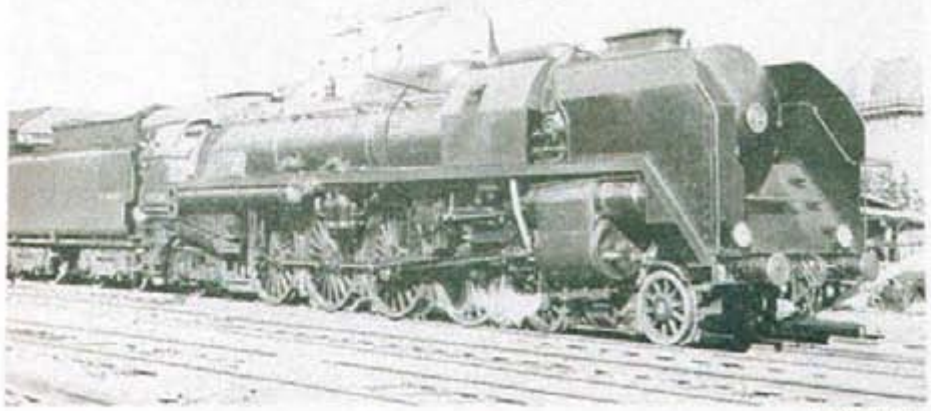
It was as Chief Engineer of the Paris-Orleans system, a post to which he was appointed in 1925, that Chapelon's name first attracted attention outside France. His rebuilt P-O Pacifics demonstrated the outstanding improvements made possible by high superheat, efficient valve gear and exhaust arrangements, and careful attention to the design of steam ports and passages. Soon more and more locomotive engineers were incorporating "Chapelon principles" into their new designs.

His work was not always carried out in isolation. The name of le Maître, for example, was to become familiar as, with Chapelon, he developed the large-diameter chimney and multiple-jet blast pipe. Chapelon had long realized the importance of a free exhaust — he had introduced the "Kylchap" double blast pipe in 1926 — and he constantly strove to reduce cylinder back pressure without affecting the free steaming of the boiler. The le Maître principle of splitting the exhaust through a large number of nozzles gave the ideal combination of a soft, free exhaust and ample smokebox vacuum. To this day the characteristic, almost soundless exhaust remains the trademark of a Chapelon design.

But it is for the art of compounding that Chapelon's name is best remembered. Both on the P-O and, after nationalization, as head of the SNCF's Department of Steam Locomotive Studies, Chapelon devoted much of his attention to increasing locomotive efficiency by making the greatest possible use of every pound of steam. Some of his designs are described in the accompanying story; and but for the changed economic climate of the 1950's it seems certain that their successors, a range of standardized three-cylinder compounds which Chapelon formulated after the war, would have entered service in large numbers instead of remaining merely a set of blueprints. Designs for a 4-6-4, 4-8-4, 2-8-4, and 2-10-4 were evolved, but all were stillborn. If any one engine can be categorized today as embodying all of Chapelon's ideals, it is his unique 4-8-4 No 242 A 1, shown below during its trials in 1948. Although A 1 remained the solitary example of its class, Chapelon's Mountains, Mikados, and Pacifics continue even now to excite the admiration of engineers and enthusiasts from all parts of the world.

Even among the most up-to-date steam power the U.S.A. could offer, Chapelon's machines would have acquitted themselves with honor. One comparison — often conveniently forgotten in this country — matched 242 A 1 with a Pennsylvania T1. At 62 mph the 4-4-4-4, with a grate area of 92 square feet, developed 4000 drawbar horsepower; the Chapelon engine, at the same speed, produced over 5000 drawbar horsepower from a grate a little over half the size and at a specific fuel consumption some 20 per cent less.

Today André Chapelon can be found in comfortable retirement not far from Paris. His life's work lives on, not merely in his native France but, say, in Brazil, where postwar Chapelon 2-8-4's and 4-8-4's still polish the meter-gauge metals, or in the Argentine where 75 old General Roca 4-8-0's have received a new lease on life under his direction. I



*La Vie du Rail*

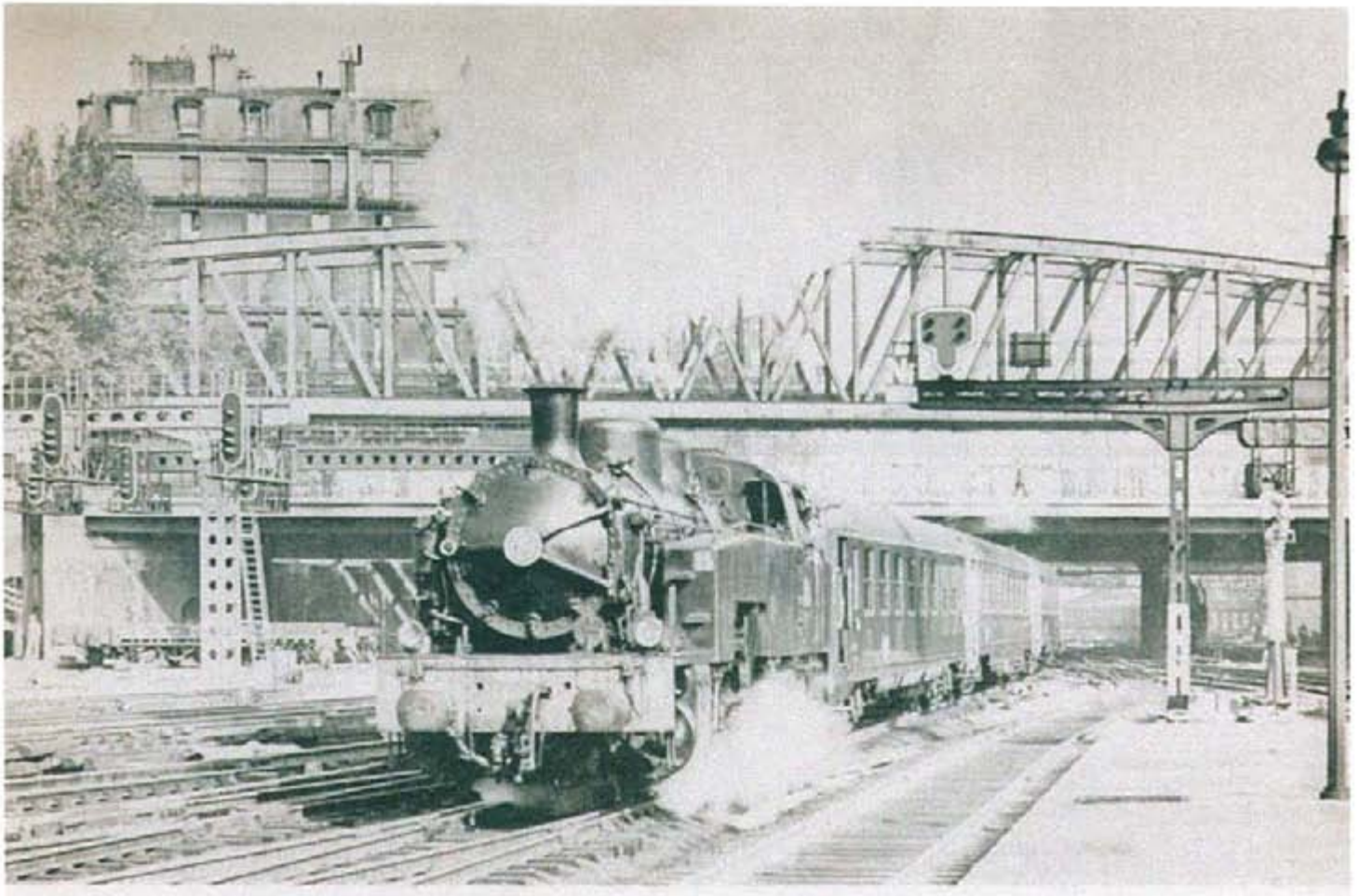
those that do would be of little interest to the casual tourist.

To the rail enthusiast, however, the lines in and around the capital are well worth some study, especially the two which encircle it and connect all the main lines radiating from the city. These are the two Ceinture lines — Petite and Grande respectively, at one time both controlled by the Nord. Today they are operated by the Nord and Ouest regions jointly. Indeed, *Chauffeur* Vernier had mentioned having begun his firing career on steam-operated Grande Ceinture freights, so it was with particular interest that I traveled out to Pierrefitte one day soon after my arrival from Cherbourg to sample one of the few remaining steam movements around this important belt line.

Although some steam-operated freight moves around the electrified Petite Ceinture, most of its traffic consists of local passenger trains serving the inner suburbs. The Grande Ceinture, on the other hand, circles the city at a radius of 10 to 12 miles; and apart from one short electrified section between Juvisy on the PLM and Versailles on the Ouest, the line is used solely for transfer freight workings and for through freight or passenger trains avoiding Paris. Until the mid-1950's steam ruled supreme on the Grande Ceinture, including two classes of four-cylinder Mallet compounds, all 0-6-2+2-6-0 tanks built between 1905 and 1911. More modern steam power was provided by Ceinture 2-10-2 tanks of Class 151 TA and by 10 big 1939-vintage 2-10-2 tanks of Class 151 TQ, with occasional assistance from some postwar 0-10-0 tanks built more specifically for work in the freight marshaling yards served by the Ceinture. By 1959 Baldwin diesels had begun to oust steam, but some of these more recent two-cylinder tanks were still working from Bobigny shed, a short distance clockwise around the Grande Ceinture from its junction with the Nord main line at Pierrefitte.

Here I was to join a through sleeping-car train from Boulogne — on the Channel coast — destined for Marseilles. I had not long to wait before the long blue-and-green consist, headed by its smart compound Nord Pacific, came to a stop just short of the junction. Two cars at the rear were to be detached, and they would continue down the main line to the Gare du Nord, the Northern region's terminal in the center of Paris, while the major portion of the train made its way around the Ceinture to join the former PLM main line south of the city.

With flanges protesting, we picked our way round the sharp left-hand curve and up onto the double-tracked



*Postwar 10-coupled tank 050 TQ 2 hustles into Gare du Nord, Paris.*

Ceinture line, passing on our right a long diesel-hauled transfer freight awaiting our passage before following us as far as Bobigny. The shed here handles most Ceinture traffic, and as we drew to a stand the big 0-10-0 tank booked to replace our mainline engine was already moving out from the shed yard. Quickly the Nord Pacific was uncoupled; it pulled away as 050 TQ 4 backed gently down onto the train. Little time was wasted in the change-over. No sooner had I climbed aboard than our new *mécanicien* yanked open the regulator and TQ 4's 10 squat drivers began to roll.

The staccato bark of this two-cylinder simple was in harsh contrast to the almost silent exhaust of the big-wheeled compound Pacific. Acceleration was rapid; and surprisingly, the speedometer needle was quickly hovering near the 50 km. mark, maximum permitted speed for these 10-coupled tanks.

Freight traffic on the adjacent track was heavy — predominantly diesel-hauled, with occasional big tanks like TQ 4. Far away on our right the Eiffel Tower rose above the rooftops of Paris; on our left was open country, with newly built industrial plants at intervals beside the line.

Curving round to the right, we swung over the Est main line. As we hammered over the bridge a big smoke-deflectored 4-8-2 flashed beneath us heading towards Switzerland with some international express. Here at Noisy-le-Sec is a large Est steam shed, and the yards were hazy with soft coal smoke. These big Est and Alsace-Lorraine machines were among the more impressive pregrouping locomotives.

We shall make their closer acquaintance in due course.

The roomy cab of TQ 4 was typical of the modern SNCF tank engine — again the pendant firedoor, the Flaman chart recorder, and well-instrumented backplate. All was spotlessly clean, even though this machine was a "chain-gang," or common-user, engine handled by perhaps two or three crews in a day. No clouds of steam escaping from sundry joints and glands; none of the ominous knocks from the motion that one would expect from a comparable British locomotive. Even the riding was good, despite the absence of carrying wheels.

Another big locomotive shed ahead — Villeneuve St. Georges. All too soon our Ceinture trip was coming to an end, for Villeneuve, as well as being one of the largest marshaling yards in northern France, marks the junction with the ex-PLM main line from Paris' Gare de Lyon. Here were once stabled well over 130 steam engines. Today the PLM main line is electrified over its entire length from Paris to the Mediterranean. Villeneuve's huge coaling plant has been replaced by oil fuel tanks to supply the diesel yard shunters, and only a line of dead and rusting steam power reminds us of days past.

One PLM class reprieved from this fate was the very fine 242 TA series of 4-8-4 tanks — large four-cylinder compounds designed in 1927 for the PLM *banlieue*, the network of suburban lines terminating at the Gare de Lyon. When electrification made them redundant many were transferred to the Western and Northern regions, whose high-speed push-and-pull suburban services were among the more remarkable sights of SNCF steam.

No visitor to Paris can have failed to notice these outer-suburban expresses — eight-car rakes of modern double-deck cars pulling out behind big 2-8-2 and 4-8-4 tanks. On the northbound journey, to Creil or Valmondois or Pontoise, the locomotive leads; on the inward journey, however, the *mécanicien* merely transfers to a special *poste de commande* in what was the rear car while the en-

gine, running in reverse, propels the train back into Paris.

Although in 1959 the ex-PLM 4-8-4 tanks handled certain trains, the majority of these push-and-pull workings were still in charge of the Nord 2-8-2 tanks built especially for them. Seventy-two of these two-cylinder simples were built between 1932 and 1935; they were designed to combine rapid acceleration with good fuel economy. Classed 141 TC by the SNCF, they were among the first locomotives to employ the rotary-cam poppet valve gear designed by M. Cossart, chief engineer of the Nord at that time. In a period when electrification on the south side of Paris was proceeding apace they represented a new approach to the problem of suburban rail transportation.

Twice I traveled on them out of the Gare du Nord; each time I was impressed by their startling acceleration, which approached that of electric traction yet without a trace of slip. One tightly timed route is that to Valmondois — 19 miles of generally rising grade to be covered in 53 minutes with 12 station stops. The evening rush hour was in full swing as we pulled out with the taillights of the preceding train seemingly only a few hundred feet ahead of us. Our engine was 141 TC 3, working chimney first on a standard eight-coach train packed with homebound suburbanites.

The start northward out of Paris favors the engine. For a couple of miles we accelerated down the 0.4 per cent grade, reaching a top speed of 55 mph before shutting off steam for the fly-under junction at St. Denis, where we left the main line and began to climb. Even on this suburban tank engine a remarkably full complement of gauges faced the crew. An electric fan was provided, and of course phone and loudspeaker connections to the driving compartment at the other end of the train. At one stop, Bessancourt, the *chauffeur* operated the rocking grate — a modern device actuated by a compressed-air servomotor beneath the bunker. Bessancourt is at the foot of the steepest section of the entire route, a climb at 1.5 per cent to Frepillon summit; and here the 53,000-pound tractive effort really proved its worth. Driving-wheel diameter is only 5 feet 1 inch, limiting the engines to 65 mph; but this is amply compensated for by their performance uphill.

Returning to Paris, 141 TC 3 propelled the train, under control of the *mécanicien* in the leading car. Under these conditions, the *chauffeur* remains on the footplate and manipulates throttle and cutoff; blasts on the hooter signal throttle commands, while orders and queries come over the loudspeaker.

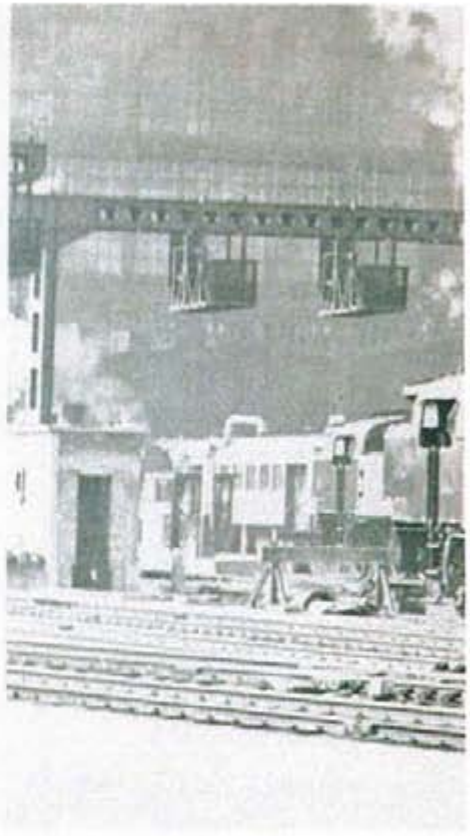
One final diversion remained before leaving Paris. A few miles south of the city lies the suburb of Vitry, where in 1933 was built France's only locomotive test plant. No testing was being carried out at the time of my visit, but at the nearby running shed, I knew, were two outstanding examples of modern steam power — Chapelon's unique rebuilds 242 A 1 and 160 A 1.

In the early 1930's, at about the time that Chapelon's rebuilt Pacifics were beginning to attract attention on the Paris-Orleans, the hard-pressed operating department of the Etat was faced with a new challenge — working the greatly accelerated boat trains between Cherbourg and Paris. At that time, remember, the Etat's Pacifics were far removed in performance from the machines they were to become after rebuilding. The logical step was to build a bigger locomotive altogether; so in 1932 there appeared a three-cylinder simple 4-8-2, a distinct departure from the four cylinders and compound expansion to which the French were addicted.

Unhappily, the engine's 55,000-pound tractive effort and 6-foot 5-inch wheels were no match for the steep and often slippery grades of the Cherbourg line. The boat trains soon reverted to Pacific haulage, and the prototype 4-8-2 languished out of use until the war. In 1946, however, it reappeared — transformed into a three-cylinder compound 4-8-4 embodying every aid to efficiency that André Chapelon's skill could devise. Weight had increased by 20 tons (necessitating the four-wheel trailing truck), since the original copper firebox had been replaced by a much larger steel box with two thermic syphons. Compounding was on the Smith system, the high-pressure cylinder between the frames. Its valve was driven from the third left-hand coupled wheel — hence the unusual sight of two sets of motion on that side. Willoteaux double-port valves for the outside cylinders and Trick valves for the center one exhausted to triple blast pipes and chimneys; a Houlet superheater produced steam at the very high temperature (for a locomotive) of 850 degrees Fahrenheit.

Trials of 242 A 1 confirmed the performance that its design promised. On one test, over the heavily graded St Etienne line between Lyons and St.-Germain-des-Fossés, 4200 h.p. was developed on a 1.1 per cent grade; acceleration from rest, this time on level track, saw 62 mph reached in 3 minutes 10 seconds — this with a train weighing over 600 tons.

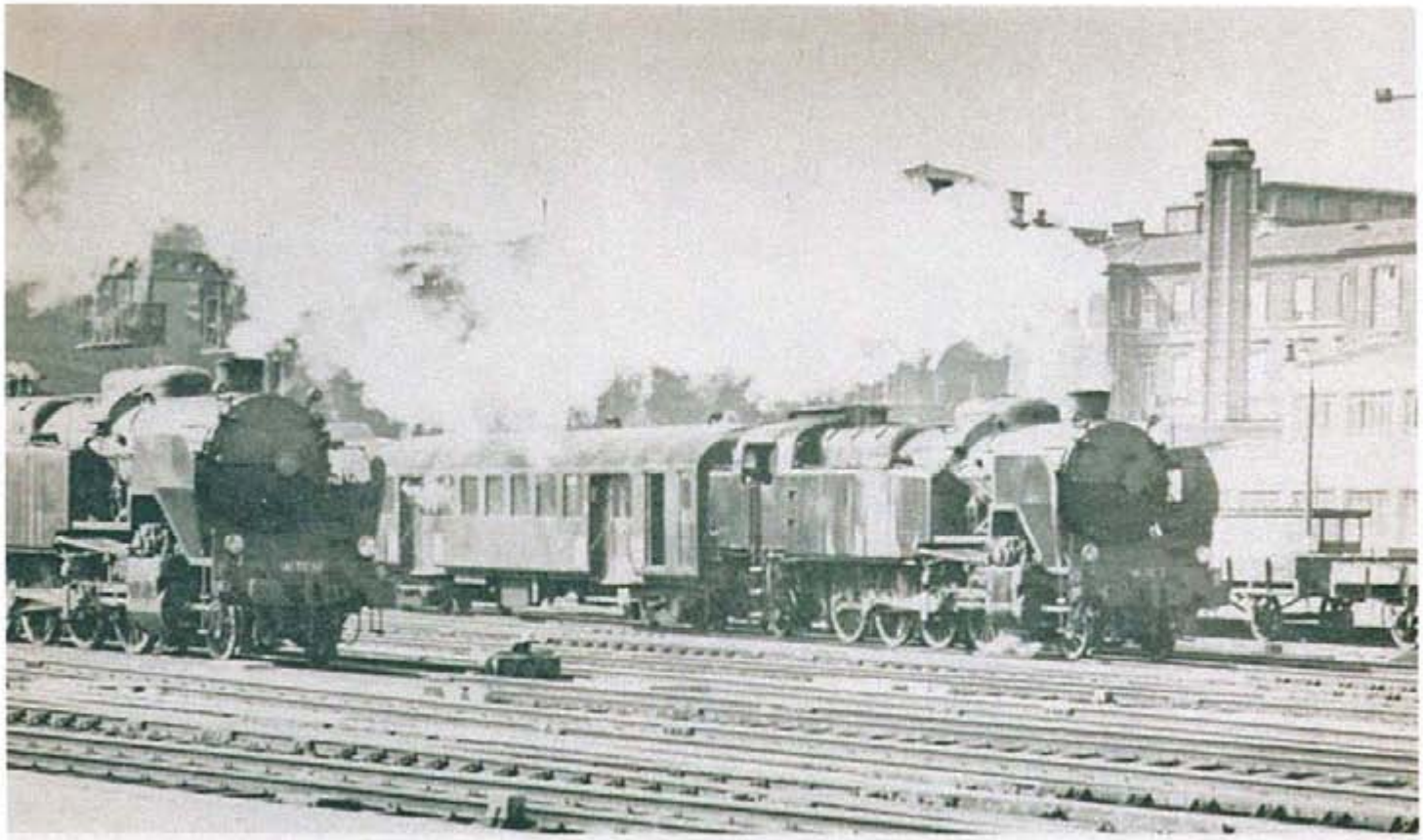
In one respect 242 A 1 was stillborn: the die was cast for electrification and dieselization, and no further 4-8-4's



were built. Thoughts of what might have been had the design been perpetuated were stilled as I climbed up into the roomy cab. It was sufficient that even this opportunity remained. Never had I seen a cab layout so complex. Gauges and controls filled not merely the backplate but every available space at both sides. Clearly the driver alone could not give them due attention; but this was an experimental machine and invariably technicians were on board to record results during its test runs.

As a revenue-earning unit of SNCF motive power, 242 A 1 contributed little. Had M. Chapelon's plans materialized, a new era would have been inaugurated for the compound locomotive in France: 2-8-2's, Mountains, and 2-10-4's all were envisaged, but in the changed climate of the 1950's none progressed further than the drawing board.

One outstanding prototype which did materialize, and now shared the same grass-grown siding as 242 A 1, remains unique in all Europe. Between 1910 and 1912 the Paris-Orleans Railway built a series of heavy 2-10-0 freight locomotives which on formation of the SNCF became Nos. 150 A 001 to 070. They were four-cylinder machines with 4-foot 8-inch wheels. In 1939 one of them, No. 150 A 30, was chosen to be extensively rebuilt as a possible prototype standard heavy freight engine.



*Suburban trains out of Gare du Nord, Paris, are worked by 72 2-8-2T's.*

The resulting "rebuild" in fact turned out to be a six-cylinder 2-12-0 compound numbered 160 A 1, utilizing a few of the original parts such as the wheels, and violating sundry cherished design principles with apparent success. For example, not only was the drive divided, but the second, third, and fourth axles were all driven. The high-pressure cylinders, far back between the frames, drove the fourth axle and exhausted through a second superheater into four low-pressure cylinders in-line beneath the smokebox. Of these the inside pair drove the second axle and the outside pair the third. Unlike the PLM 2-4-6-2 compounds with coupling rods between the frames, whose intricacies I was to study later, the 160 A 1 had wheels that were kept in step by conventional outside rods.

Poppet valves all around, actuated by Walschaerts gear, followed Chapelon practice. Tractive effort was 65,000 pounds; and with an engine weight of 138 *tonnes*, sufficient adhesion was obtained to enable 4000-*tonne* trains to be started from rest. Naturally, wartime conditions prevented much use being made of 160 A 1, but in the early 1950's extensive trials were carried out both on the road and at Vitry.

The economic train length proved too great for convenient operation, and by mid-decade 160 A 1 had joined her ill-starred 4-8-4 sister in storage. The chill of winter seemed to hang in the air that autumn morning at Vitry as I stood beside the two A 1's and reflected on their past days of greatness. Neither of them, as far as is known, ever turned a wheel again.

400 MILES south, almost, one must travel before once more encountering the scent of steam and hot cylinder oil. Ten *départements* and eight great rivers must be crossed, with the sun growing a little hotter, the men a shade darker at every station through the long day's ride. Cher, Loire, and Indre, fabled rivers of the Châteaux country . . . Creuse, Vienne, Charente, and Dordogne . . . and toward evening we swung alongside the wide estuary of the Garonne and braked smoothly over the high girder bridge into Bordeaux.

Like all traffic on this P-O main line, the *Sud Express* on which I traveled has long been electrically hauled. From here it would roll on through the night, still under the 1500-volt catenary, to Irún and the Spanish frontier. Although the lines approaching Bordeaux from the north are the exclusive domain of electric and diesel traction, the old Midi line running southeast, parallel to the Pyrénées, is still the preserve of steam. Electrification from Bordeaux to Montauban, where the Midi joins the more easterly P-O main line through Vierzon and Limoges, is not scheduled until 1967.

So Bordeaux St. Jean shed plays host to a motley variety of motive power: old Midi and P-O electrics and modern SNCF diesels contrast with PLM Pacifics and graceful old P-O 4-6-0's. Frequent visitors, too, are the 141 E and 141 F Mikado versions of the PLM Pacifics, big 2-8-2's built for mountaineering and whose feats in the Cévennes are legendary. Many were used on the steep Simplon main line from Dijon to the Swiss frontier, but when that was electrified after the war they emigrated to Périgueux on the Sud-Ouest and from there they work into Bordeaux.

My immediate interest lay in a very different breed of locomotive, however. For from Bordeaux work 20 of the postwar American and Canadian Mikes of Class 141 R, the ubiquitous mixed-traffic machines supplied under Marshall Aid. It was on one of them that I planned to travel next. True common-user engines these. Meriting, and receiving, little more than the minimum amount of maintenance to keep them on the road, they contrast markedly with their indigenous French cousins. 141 R 871 was no exception. The paint date, barely visible beneath layers of grime, read 12/56; and in the 2½ years since that last visit to the shops, R 871 had accumulated probably 100,000 miles of hard thrashing. In true North American fashion these Lima, Baldwin, and Alco products thrive on hard work and poor fuel. No pretense is made that they are

economical. Indeed, their average coal consumption is some 50 per cent greater that that of the 141 P Chapelon compounds on similar duties. But their capacity for moving tonnage is unexcelled, and I looked forward to a noteworthy trip as we picked our way over the network of tracks out of the shed yard. Our immediate destination was the big freight concentration yard in the inverted V between the Irún main line and that southeast along the Garonne. Here we were to take over a heavy freight bound for Toulouse.

Cab fittings on R 871 were essentially American, save that they were arranged for left-hand drive. The throttle was of conventional hanging type; mechanical stoker and power reverse added to the impression of a typical U. S. heavy Mike. Riding was also reminiscent of U. S. practice — hard and harsh, very different from the light, springy motion of the well-balanced three- and four-cylindered engines I had become used to. Long before we had lifted our train out of the yard limits it was clear we were in for a rough trip.

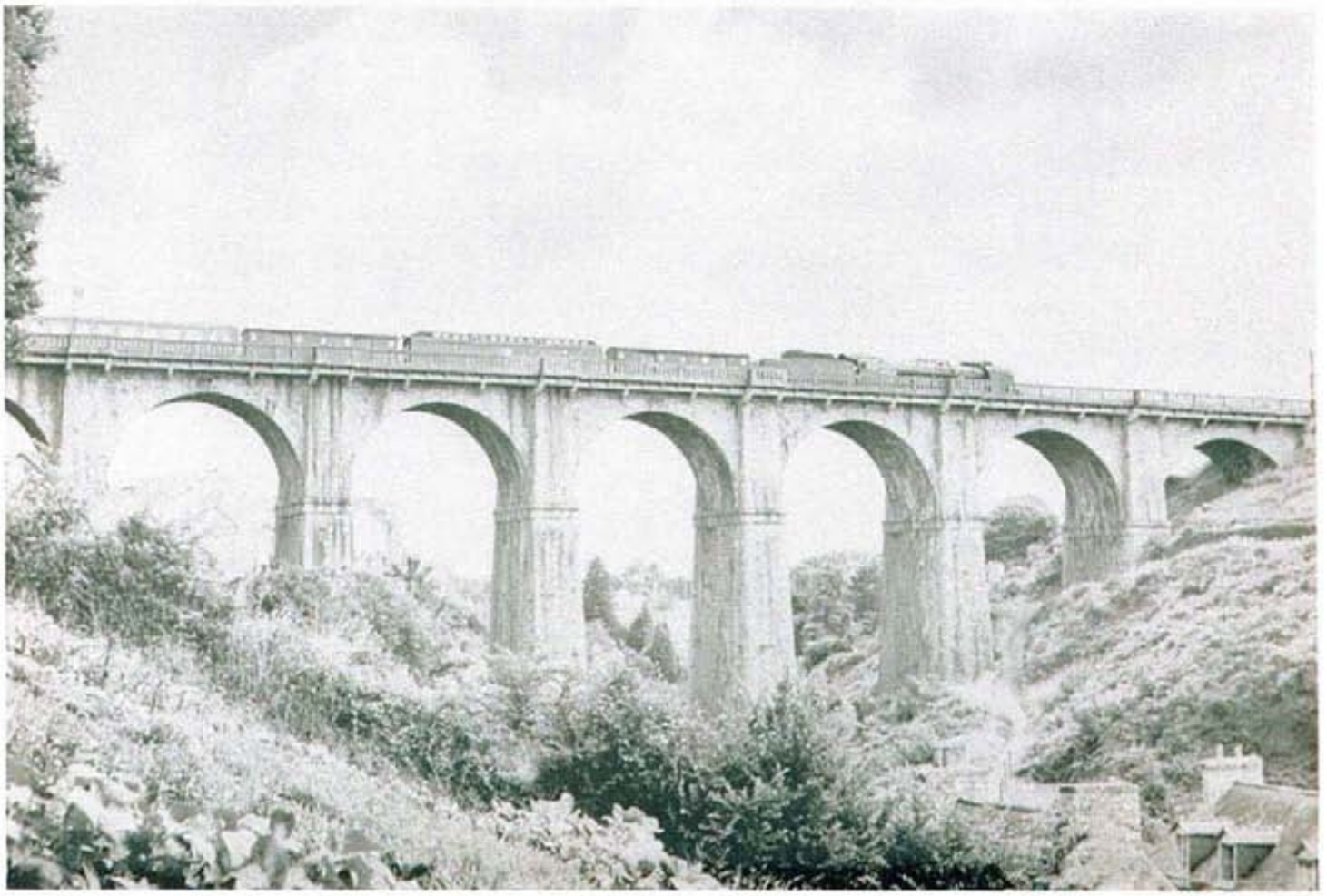
Boiler pressure on the 141 R's is 228 pounds; coupled wheels are 5 feet 6 inches in diameter; and tractive effort is a little over 53,000 pounds. Roller bearings on all wheels and self-adjusting wedges contribute to easy maintenance; and of course, firemen swear by the engines, since those not fitted for oil-burning have mechanical stokers. Maximum permitted speed is 55 mph, but it was clear that before we approached 55 mph on *this* trip we should be running along the ties. Even with the speedometer needle swinging around the 50-kilometer mark, R 871 was doing everything a well-behaved engine should not do — rolling, nosing, and pitching, while the footplate vibrated so violently that sitting was impossible. Seats of the round bar-stool pattern are uncomfortable at the best of times, but on this hammering footplate they felt positively dangerous.

French goods traffic is of two classes: *ordinaire* and *accéléré*. Our 700-tonne train was the latter. The working timetable allowed only 40 minutes for the first 28 miles to Langon, and *Mécanicien* Vasseur obviously intended to adhere to it whether we ran on the rails or the ballast. With throttle full open and cutoff between 25 and 40 per cent, we kept our speed in the 40's on this straight, level stretch through the Sauternes country, where every wayside station has its place in the wine merchants' catalog. Beyond Langon we began to climb; oxen could be seen plowing or carting in the vineyards, and far on our right the foothills of the Pyrénées began to rise above the plains of Gascony.

A box girder bridge marked the river Lot where it joins the Garonne near Aiguillon. Here the grade steepened, and R 871's exhaust became sharper as Vasseur lengthened the cutoff to 55 per cent. Speed lessened a little, but still the footplate bucked and swayed. It occurred to me that no *chauffeur* could hand-fire under these conditions — he could only hope that no tramp-iron jammed the stoker screw. On the hillsides, yellow farmhouses slumbered in the hot midday sun. The temperature in the cab was well into the 90's, and more than once I wished the trip were over. St. Hilaire marked the end of the climb, and then it was easy coasting downhill to the water stop at Agen.

Here road, railway, river, and canal share the valley. Agen is the junction for the former P-O single line north to Périgueux, in the heart of the Massif, and for a long winding Midi branch southward to Auch and, eventually, Tarbes in Hautes-Pyrénées. About 20 locomotives are allocated to the small shed adjoining the station, and I noticed a number of the big PLM 2-8-2's stored out of use in the yard. Passenger trains on this Bordeaux-Montauban route are han-

*The 9:40 a.m. Brest-Paris express leaves St. Brieuc behind 241 P 27.*



dled by PLM 231 G class Pacifics, but they too will be retired when electrification is complete.

For R 871 the worst part of the journey was over; from Agen we should face only one short adverse grade on the long descent to Montauban. Speed was held down in deference to the short-wheelbase vehicles forming our train, and the mechanical stoker was shut off periodically as we rolled down through the valley of the Tarn. Some way before Montauban the overhead wires began as the P-O line from Paris and Limoges came in from the left — a signal for Vasseur to begin applying the brakes to bring us to a stand outside the station. A small steam shed remains here too, for this is the limit of steam working. R 871 cut off and was replaced by a modern B-B electric for the 30 miles on to the important St. Jory freight yards west of Toulouse.

Little interest remains for the steam devotee in this corner of France. As on much of the Midi system under Jean-Raôul Paul, its famous engineer-turned-general manager, electrification was widespread by the end of the 1920's. On some of these Pyrénées lines Paul pioneered 16⅔-cycle alternating current long before the government decreed that 1500-volt D.C. should be the standard for any future electrification elsewhere in the country. Now the wheel has turned full cycle, and the SNCF leads the world in railroad A.C. technology.

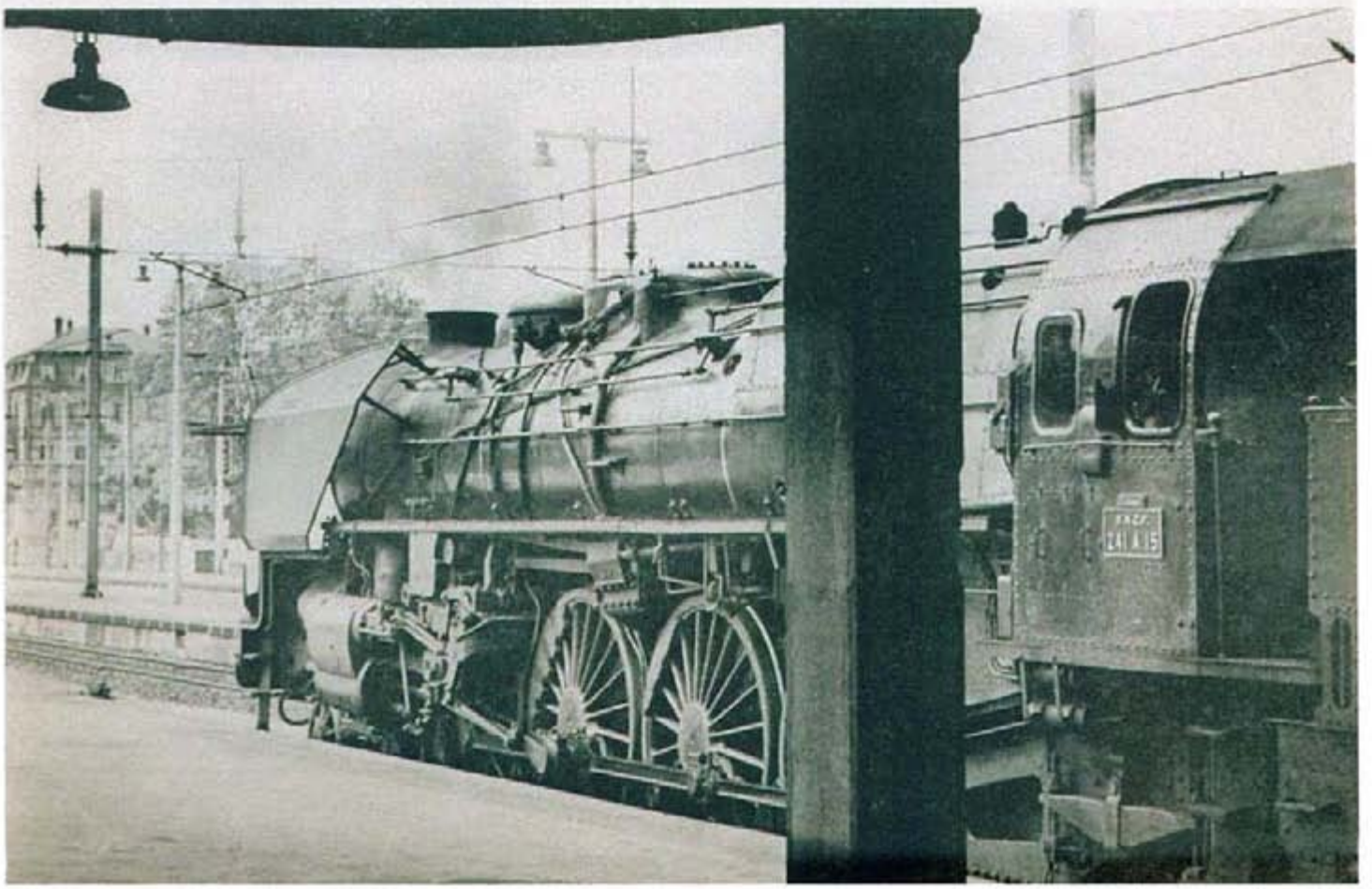
From Bordeaux and Toulouse east to Narbonne, thence along the coast to Sète, the Midi linked Atlantic and Mediterranean; at Sète it made an end-on junction with the PLM. Today this coastal line is largely electrified, although oil-burning 141 R's still handle traffic south from Narbonne to the frontier at Cerbère. East from Marseilles the catenary will soon reach Ventimiglia, and the heavy oil smoke of 141 R's will no longer hang over the beaches of the Riviera. No fewer than 70 of them are stabled at Nice, a few miles short of the Italian frontier. They are responsible for all traffic along this Riviera coast, from humble freight to glamorous *Mistral*.

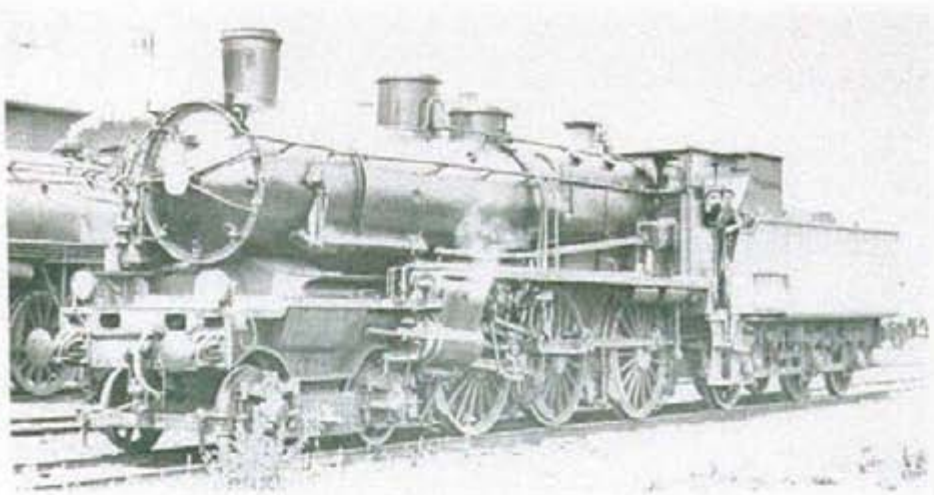
Marseilles, gateway to French Africa and the East, is a city of contrasts. As in many seaports, luxury and poverty go side by side. I spent some days there exploring this fascinating corner of Provence and its coastline. Railroad interest was not lacking, and I passed a pleasant day at each of the two big sheds, one catering principally to passenger locomotives and the other to freight. At the latter shed, Blancarde, I became proficient with the fire shovel as I spent a morning firing one of the ubiquitous PLM 0-8-0 shunting tanks pottering about between the freight yard and the docks. Fuel was a mixture of coal dust, briquettes, and fines. Most French engines carry briquettes only for emergency, but 040 TC 26 apparently thrived on the diet, provided I stirred things up with the fire irons now and again.

Passenger locomotives at Marseilles included 10 of the magnificent post-war Mountains of Class 241 P, and I joined one of these, 241 P 3, one morning for the journey north to Lyons. Our train was a Nice-Paris *rapide*, and while we awaited its arrival in the terminal station of Marseilles St. Charles, I spent a few minutes getting acquainted with our big 4-8-2.

France was the first country in Europe to adopt the Mountain type. Similar designs emerged on both the Est and the PLM in 1925. The type was developed on the latter railway in particular. Four varieties appeared, and one of them, No. 241 C 1, became the prototype of Chapelon's *chef-d'oeuvre*, the 241 P. Thirty-five were built between 1947 and 1949, and many are still in service today on the express duties for which they were designed. They are four-cylinder compounds, with high-pressure cylinders between the frames. Herein lies their

*Mountain 241 A 15 alert at Nancy for Paris run described in the article.*

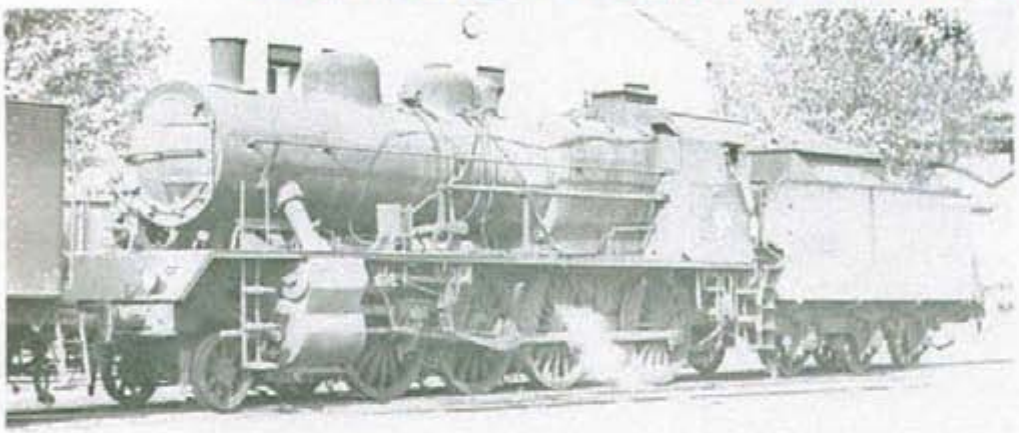




TOP-LINK express engines of prewar lightweight "trains de luxe" era were 150 Nord four-cylinder de Glehn compound 4-6-0's. Many remain active on SNCF in the system's 230 D class.

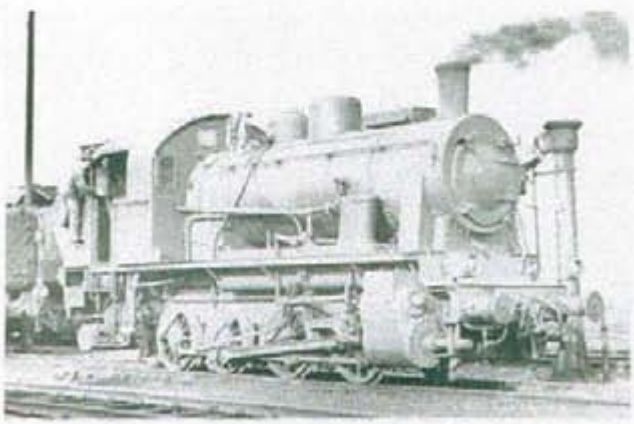
FORMER Paris-Orleans two-cylinder simple 230 G-class 4-6-0's — built during 1913-1922 —

# Sundry steam in France about

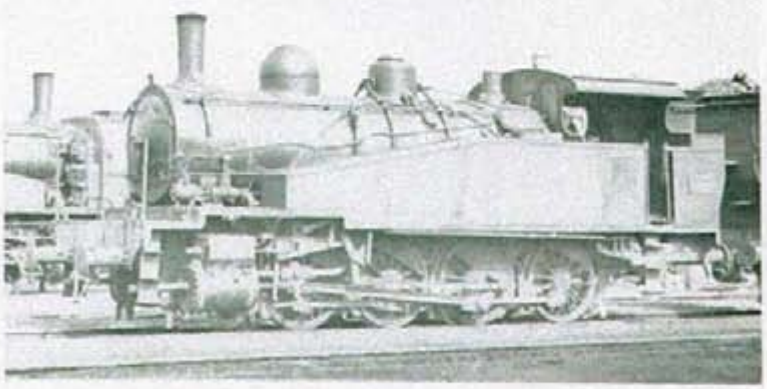


PLM RELIED on two-cylinder simple and four-cylinder compound Consolidations to move tonnage. Compounds are a memory, but simple 2-8-0's are still to be found on roster in Class 140 J.

OVERSHADOWED by Liberation Mikes are more than 900 American 2-8-0's exported to



REPARATIONS of World War II placed 60 German 0-8-0T's on the SNCF roster in Class 040 TX. A hostler wipes the cab glass of the 040 TX 50 while she is stationed at Batignolles in 1962.

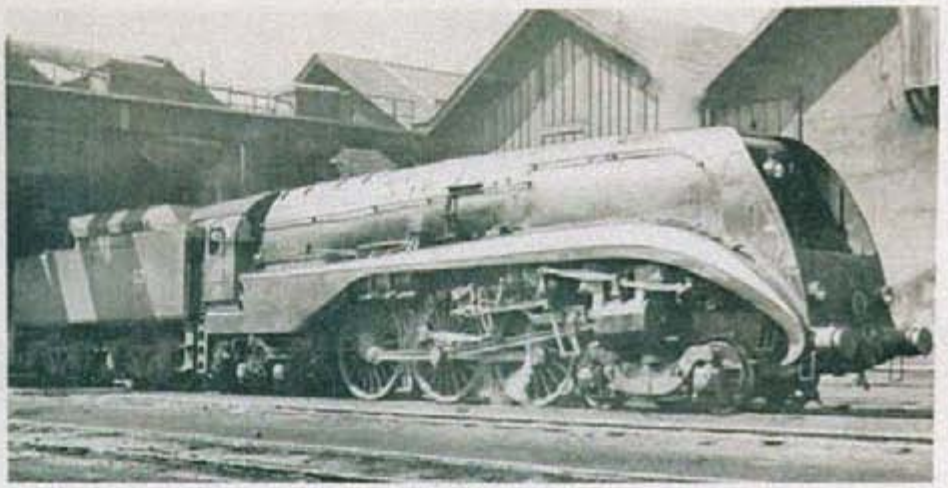


COMMONPLACE in yards of western France are ex-Etat two-cylinder 0-8-0T's of Class 040 TA. Almost their only concession to modernity is steam reverse gear located above the steam chest.

one weakness, since in a machine of this type, able to develop 4000 h.p., providing adequate bearing surface for the high-pressure cranks and journals is difficult. Hence Chapelon's reversion to three-cylinder (Smith system) compounding for his 4-8-4 described earlier. Driving wheel diameter is 6 feet 6½ inches, boiler pressure 290 pounds — producing a tractive effort of 45,000 pounds. Total weight is 202 tons.

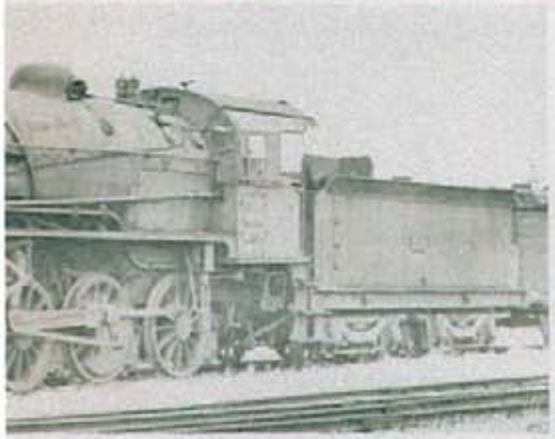
The cab arrangement on 241 P 3 followed the style already remarked upon: comprehensive instrumentation including superheater-temperature and steam-chest-pressure gauges; the inevitable Flaman recorder; and a

till occasionally handle local passenger trains. ome wound up in Morocco between World Wars.



FOUR-CYLINDER compound version of the de Caso Hudson is represented by 232 S 2, one of four built in 1939-1940 for heavy expresses between Paris, Lille, and Belgian frontier.

# which you should know



rance in World War I. Ex-P-O 7049, subsequent- y SNCF's 140 H 749, was built by Alco in 1918.

STORED out of service at Vitry is the 160 A 1, remarkable six-cylinder 2-12-0 whose career is described in the accompanying text. She's a Gallic variation on our duplex-drive theme.

IKE tanker 141 TB 457 typifies French suburban passenger ower of a half century ago. The ex-Est engine is one of more an 100 which survived war to work out of Gare de l'Est, Paris.

TEN of these chunky 151 TQ tanks were built in 1939 to handle tonnage over Grande Ceinture belt line around Paris. Displaced there by diesels, some can be found on Northern Region.

triple gauge showing stoker engine, boiler, and distributing jet pressures. Coal provided for these mechanically fired engines is a good-quality, screened variety—small enough to need no crushing, but not so small that it passes through the tubes unburned. Brick arch design is such that the combustion gas path is longer than normal, helping cut down fuel wastage.

While we were standing, the stoker was shut off and the fire damped well down. Yet within a very few minutes after we had backed onto our train, the fire had been transformed into an even, white-hot layer and the pressure-gauge needle was hovering on

the red line. Brake testing on the 16-coach train took an additional few minutes, and 6 minutes "down" we eased our 800-*tonne* consist into motion. Acceleration was brisk; once the regulation running brake test was over we were soon rolling through the outskirts of Marseilles at a steady 50 mph with ¾ regulator and 40 per cent cut-off. The latter cannot be varied between low-pressure and high-pressure cylinders, as in earlier compounds, and one handwheel controls both sets of Walschaerts valve gear.

Clear of the city, speed picked up. Seventy-five miles an hour was the limit all the way to Lyons, and with our 800-*tonne* train no difficulty would be met in making up the 6-minute deficit on the gently rising grade to our first stop at Avignon. The riding of this beautifully balanced engine was perfect; scarcely a trace of swaying or rolling marred our passage. The *chauffeur* kept an eye on his triple gauge, adjusting the steam jets occasionally and supplementing the stoker feed from time to time with a few scoops of coal to the back corners.

The weather was fine and sunny, the Provençal countryside at its most attractive; yet now I was en route toward the last stages of my journey, and I was loath to relinquish the Mediterranean warmth for the cold of late autumn 600 or 700 miles north. Meanwhile, with three-quarters of the length of France still ahead, I gave some thought to the question of which route to follow from Lyons. Ultimate aim was the heavily industrialized northeast, where massive Est 2-10-0's and 4-8-2's still held the threat of the electric traction motor at bay. But between the vineyards of Provence and the slagheaps and blast furnaces of Lorraine lay many miles of 1500-volt catenary, and only by leaving this PLM main line and striking off west could I continue on or behind steam.

Parallel to the stately *ligne impériale* through Dijon and Lyons lies the PLM's alternative link with the Mediterranean, through Nevers and Moulins to Clermont-Ferrand, thence over the spectacular Cévennes route through the very heart of the Massif. The finest day's ride in all of France, south from Clermont to Nimes, before the last level lap into Marseilles — 46 tunnels between La Grand'-Combe and the summit alone. Today, alas, the *Cévenol* is a mere *autorail panoramique*, and the legendary PLM Mikados no longer rouse the echoes on the 2 per cent to la Bastide.

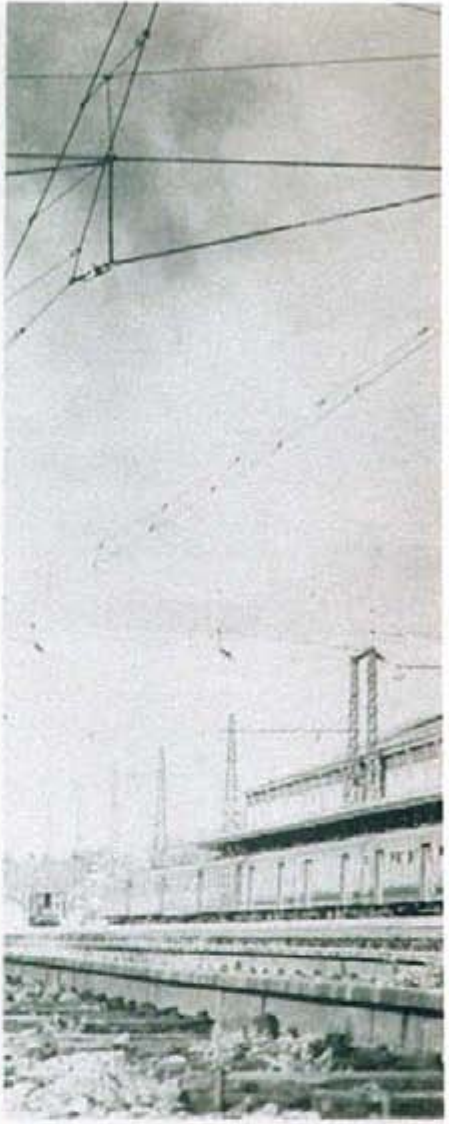
But north from Clermont steam still reigns. Nevers today is what Laroche was before the mainline electrification in 1947 — an engine changing point. Here are stabled more of the Chapelon 4-8-2's of Class P. Like their 241 C class predecessors, which similarly ended their days at Nevers, the 241 P's are being transferred here as they become redundant elsewhere. They will doubtless live out the last days of steam here too. The year 1968, I was told, will see their nemesis. Their next journey will be to the scrap yard.

So from Moulins I found myself on another Chapelon Mountain — 241 P 10. At Nevers P 10 was replaced by 241 P 1, first of the class, for the final 105 miles almost due north to Moret-les-Sablons and the junction with the Paris-Dijon main line — a fitting farewell to one of France's great locomotives.

THE engines on which I was to travel next were also 4-8-2 compounds, but very different machines from 241 P 1 and her sisters. Like most motive power of the old Est system, they are seldom seen outside the industrial northeast. Indeed, the Est has always been the least known of all French railways, although its main lines leave Paris from the largest and most modern of the city's terminals. From the Gare de l'Est they lead to Nancy and Strasbourg, with a branch to Metz and Saarbrücken; to Rheims and the Duchy of Luxembourg; and to Belfort and Mulhouse and so into Switzerland. Distances are not great — Paris to Nancy, for example, is a comfortable 220 miles — but traffic density, particularly of freight, has been sufficient to justify the spread of 25,000-volt A.C. catenary over a large part of the system.

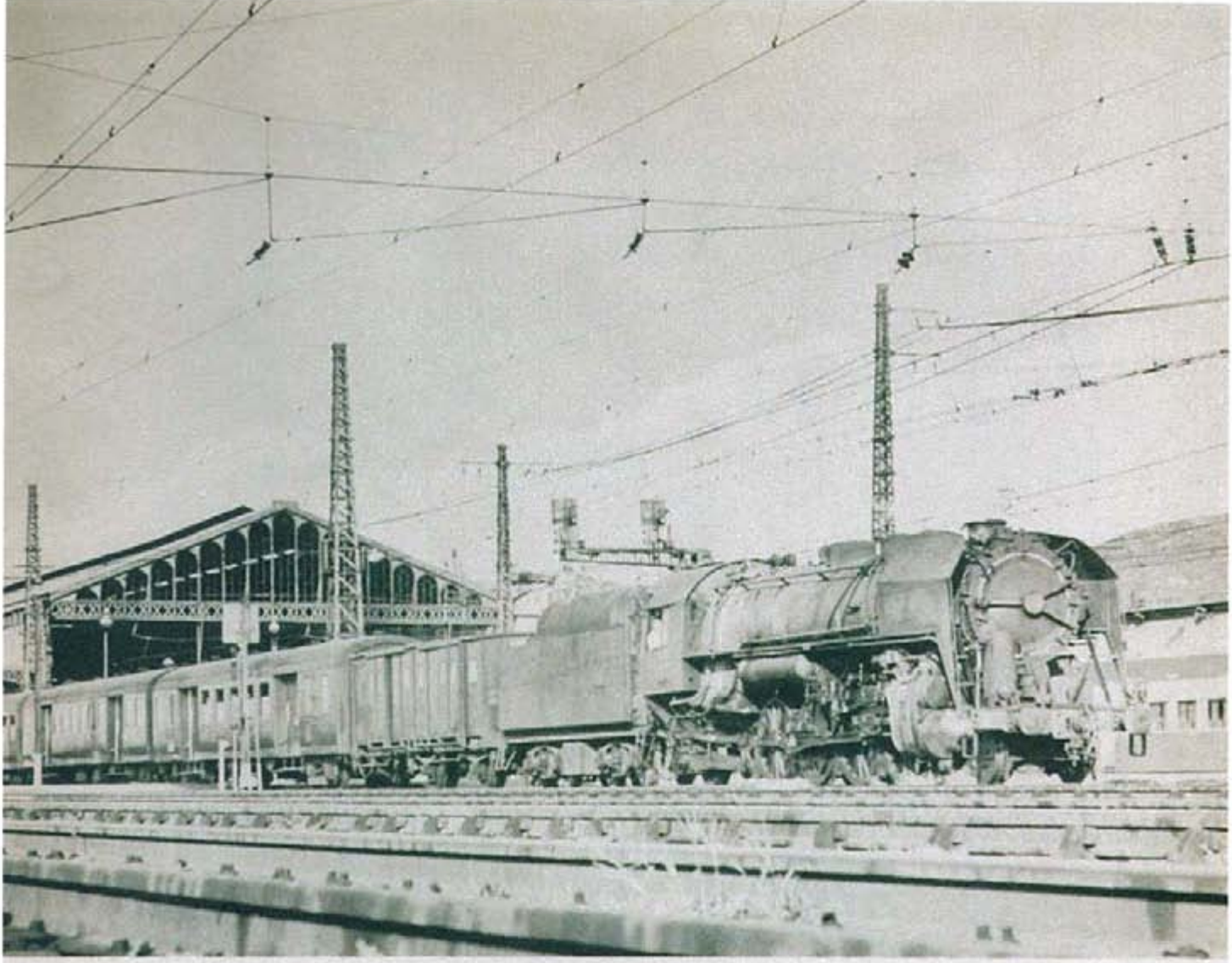
Most interest, in steam days at least, centered on the heavy iron-ore traffic from the numerous mines to the blast furnaces of Alsace and Lorraine. Towns such as Longuyon, Audun, and Conflans, almost unknown to the tourist, were rail centers of an appeal unmatched elsewhere. Through Longuyon alone every day passed some 200 iron ore trains, each of 60-ton steel hoppers headed by one of the immense 2-10-0's found nowhere else in France. These 2-10-0's were of three classes, all three-cylinder simples. Most numerous were the original Est machines introduced in 1926 — Class 150 E, of which 195 were built specifically for this traffic. The other two classes were of German origin. Class 150 C consisted of 127 engines of the Deutsche Reichsbahn Class G-12 dating from 1917. The few running in 1959 have since been cut up. Most impressive of all — and still to be seen today — were the immense 150 X class built in France during the occupation. These were identical to the Bundesbahn Class 44 machines still scattered throughout Europe as war reparations.

Variety was provided in the shape of modern SNCF 141 P Mikes and the

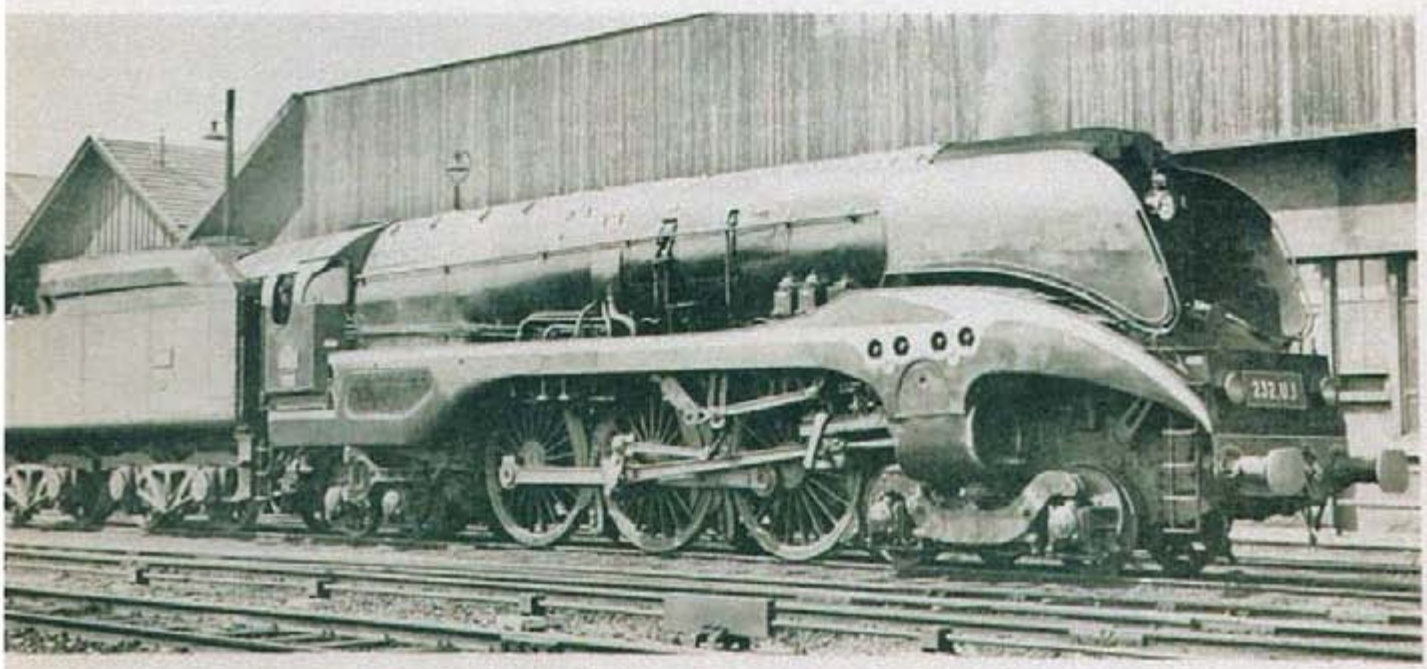


inevitable *machines Américaines* of Class 141 R. At Audun-le-Roman there awaited an even greater surprise, for here as late as 1959 lingered the unique PLM 2-4-6-2 four-cylinder compounds of Class 151 A. Ten of these were built by M. Vallantin in 1932. After the war they gravitated to the Eastern Region and joined the 2-10-0's working from Audun. In true Mallet fashion, all four cylinders were outside; the low-pressure cylinders drove the leading pair of axles, the high-pressure ones the rear three. There the similarity ended, since the wheelbase was rigid and the two sets of wheels were kept in step by coupling rods between the frames. Drivers, I learned, liked them, but not so the Audun fitters and mechanics. Maintenance proved heavy, and none of the class remain in service today.

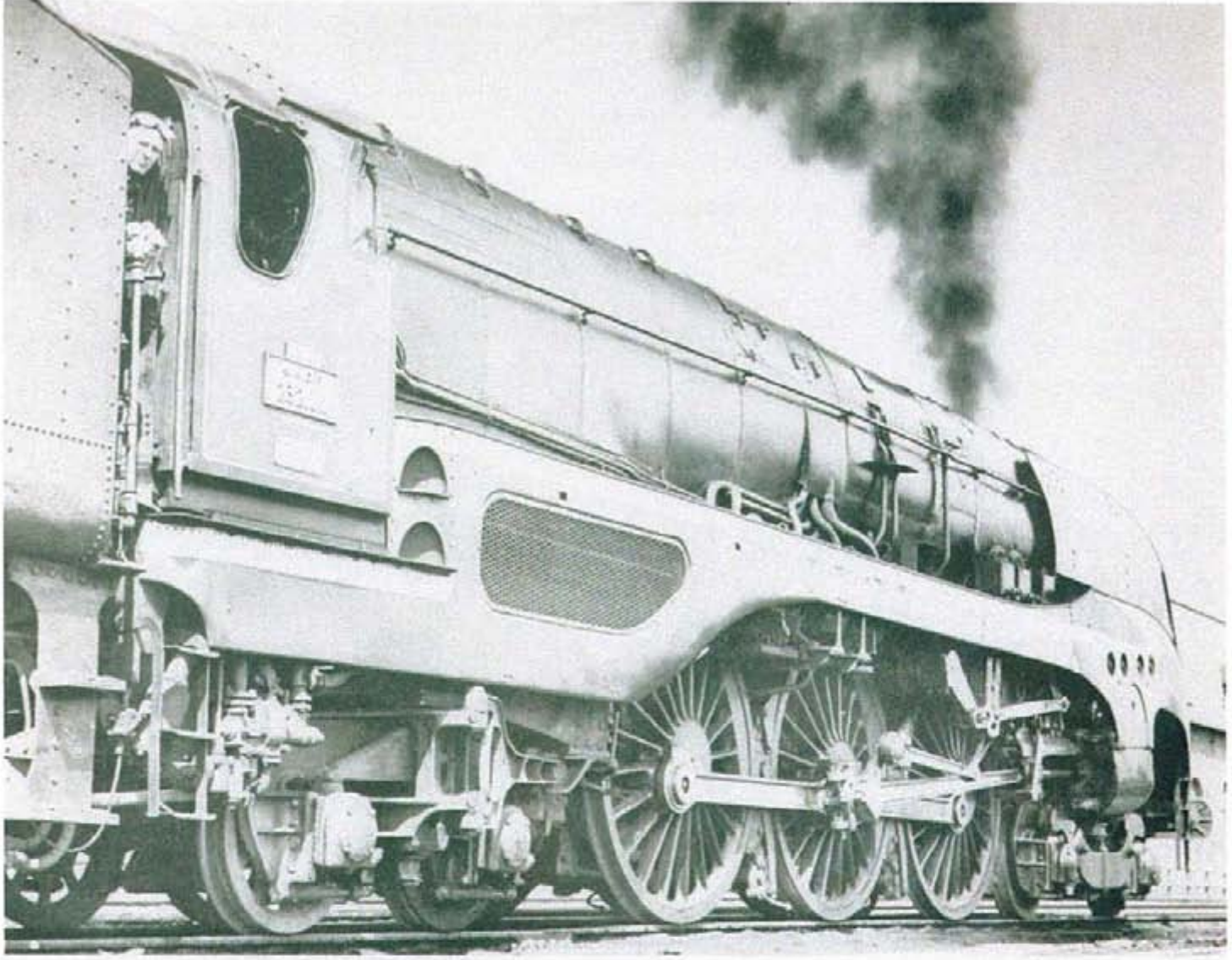
Passenger traffic on the Est main lines was relatively sparse, but the long-distance expresses were well patronized. Returning to Paris from Nancy next day, we had 16 well-filled cars grossing just under 600 tons. At the head of the train was one of the



*Liberation Mike – Baldwin 141 R 765 – leaves Narbonne for Spanish frontier.*




*Our cover Hudson – 232 U 1 – at La Chapelle preparatory to run related in text.*



*"Greatest of them all" is author's description of Hudson 232 U 1.*

first series of Mountains in Europe — No. 241 A 15 of 1925. These fine machines, originally Est Series 13, remain almost exactly as built, a living record of express locomotive design of the 1920's. Forty-one were constructed, augmented by some similar machines built for the Ouest, for which they proved too heavy. The latter were transferred to the Est before the war.

Much of the mileage in this part of France retains German signaling and operating methods. Right-hand running was the rule on the Alsace-Lorraine lines; today flyover junctions permit the change to left hand as the Alsace border is crossed. The 241 A's have left-hand drive, and westward from Nancy we were on the left track throughout.

With their big 6½-foot wheels, these Est Mountains have a fine turn of speed. They can be worked in simple or compound fashion, and pulling away from Nancy Mécanicien Giroux let speed reach 15 mph or so before cutting off steam to the low-pressure cylinders. Hand-firing the 48-square-foot grate in compound working was arduous enough; in four-cylinder simple operation it would have been impossible for more than a few minutes. Soon we were up to 75 mph; alongside flowed the Marne-Rhine canal, winding through the autumn-tinted hills of the Vosges. Temperature outside was down in the 40's — a chilly contrast with the Mediterranean heat of a few days before — and I was glad of the protection of the canvas weather-sheeting between cab and tender.

Riding was good, although not as near perfection as that of the postwar Mountains. The quietness was noteworthy — not an untoward sound from the motion, not a leak of steam anywhere. Even the exhaust was barely audible, thanks to the big Lemaitre blast pipe and chimney. Gradients made little difference to our speed. The 0.8 per cent climb to Loxeville saw speed drop from 75 to 60 mph in the 6 miles before the summit, and I made a note of the steam chest pressure readings — high pressure 255 pounds, low pressure about 45 pounds, at cut-off of 35 and 55 per cent respectively. Hard work for the fireman. His task was eased a little by the steam coal-pusher in the back of the tender, but 7 tons of coal remained for him to shovel into that vast firebox before we reached Paris.

Bar-le-Duc, 61 miles from Nancy, was our only stop. Ahead lay 158 non-stop miles to the capital, with 140 minutes allowed — an average of 68 mph. The rest of the trip was easy going, following the Marne River almost to its confluence with the Seine on the outskirts of Paris, and speed seldom dropped below 70. We passed Chalons, 51 miles, in 50 minutes; Château-Thierry — site of the great memorial commemorating that battle of 1918 in which the American Army first went into action — in 92 minutes, an average of 69 mph. So 241 A 15 rolled through the level farming countryside of the Ile de France; through Lagny and Chelles; under the same bridge

beneath the Grande Ceinture that I had crossed 3000 miles before; and as the lights of Paris came on in the autumn dusk, to a final on-time stand in the Gare de l'Est.

The next day was to be my last spent on French soil; later in the week I was to fly home from Brussels. On the principle of saving the best until last, I had arranged that the "grand finale" of my SNCF footplate travels should be from Paris to the Belgian frontier on board the legendary "U 1." Probably the most advanced steam locomotive in Europe, certainly the last word in French locomotive design, 232 U 1 stands supreme even in that country of superlatives. It well merited the early start I made next morning to La Chapelle motive power depot, where it was being prepared.

Not only was U 1 the most outstanding express passenger locomotive built in France, it was also the last, embodying all the experience of multi-cylinder engines, both simple and compound, gathered over the years. It had its genesis shortly before the outbreak of war in 1939, when the Northern Region of the SNCF placed in service seven streamlined de Caso Hudsons. Three were three-cylinder simples of Class 232 R; four, designated 232 S, were four-cylinder compounds.

Eighth member of the type was to have been fitted with a Ljungstrom turbine, but war conditions prevented this and in 1949 the locomotive entered service as a modified Class S four-cylinder compound numbered 232 U 1. Basically a de Glehn compound, U 1 differs in having the high-pressure cylinders between the frames. For ease of maintenance, the Dabeg poppet valves of the other Hudsons have been omitted and Walschaerts valve gear, with a conjugated drive to the inside cylinders, employed instead. As on other postwar compounds, the respective cutoffs are not independently variable; they remain at a fixed ratio. However, through a system of servomotors and air-operated obturator valves, the locomotive starts as a four-cylinder simple and automatically changes over to compound working as speed is gained. Other refinements include a Standard three-jet stoker, feedwater heater, roller bearings on all axles, brakes on truck and trailing wheels, and self-adjusting axleboxes. The latter, combined with equalized springing, assure magnificent riding.

232 U 1 has spent her entire life based at La Chapelle depot, working high-speed expresses north to Aulnoye and Lille. For some weeks before my trip, U 1's regular turn of duty had been the 12:05 p.m. to Aulnoye, train 171, and a return to Paris with train 144, an evening international express due into the Gare du Nord at 11:03 p.m. Today's routine was to be similar. For the northbound departure just after noon, we were scheduled to leave the shed at 11:30 a.m.; so *Mécanicien* Duteil and *Chauffeur* Douillet set about preparing U 1. They and the engine had been working as a team for some years. Duteil had complete responsibility for his locomotive, maintaining it to perfection and, if he wished, working on it in the shops during each major overhaul. While he minutely inspected the motion and running gear, with hammer and torch in hand, Douillet meanwhile began to clean and scour the side rods, then the paintwork, and finally the tires and buffer heads. Tender cleaning is the responsibility of a shed cleaning gang, and as U 1's crew brought their mount to a condition of spotless cleanliness, a half dozen youngsters set about the tender with equal enthusiasm.

By 11:15 we were all on board and Douillet was sorting out his fire. The three steam jets are adequate when running, but building up the fire while stationary demands manual assistance, since the jets give uneven coal distribution over the 56-square-foot grate. Douillet soon had the fire to his satisfaction and was able to take his ease in the right-hand seat when the time came to leave the shed. We ran forward smoothly onto the main line, then backed the mile or so down to the Gare du Nord where our train awaited.

Precisely on the advertised we got the "right away." Duteil pulled gently on the regulator and eased our 650-ton train into motion. There followed a sequence of events far removed from the "brute force and ignorance" approach so often followed in North America. Automatically, intercepting valves between high-pressure and low-pressure cylinders closed, directing the h.p. exhaust to the chimney; and air-operated regulating valves opened between h.p. and l.p. steam chests. At the same time, double-beat valves above each outside cylinder opened to admit steam for 90 per cent of the stroke. At this stage, therefore, l.p. cutoff was 90 per cent and h.p. 75 per cent.

Acceleration under these conditions was brisk, and Duteil wound his h.p. cutoff back from 75 to 55 per cent. Low-pressure cutoff, meanwhile, remained at 90 per cent. On most locomotives the fire by now would have been well on its way out of the chimney, and half the countryside alight to boot; but on U 1 the Kylchap twin exhaust was adjustable — the fire was little more than dancing on the grate. As h.p. cutoff reached 55 per cent the l.p. admission valves closed; the intercepting valves reopened, equalizing l.p. cutoff with that of the h.p. cylinders at whatever figure the driver chose; and full compound working commenced.

By this juncture we were a couple of miles out of the terminal and swinging along at 45 mph. Few engines are as sensitive to throttle and reverser as U 1, and each small tooth-by-tooth increase in regulator opening is matched by a corresponding increase on the steam-chest pressure gauge and a perceptible surge in the power felt beneath one's feet.

The long Survilliers bank was surmounted at 60 mph on 30 per cent cutoff and ⅔ regulator. Meanwhile, *Chauffeur* Douillet's attention was occupied with the water-level gauge. Chemical treatment of the mediocre Seine water leads to a tendency to prime if the glass shows more than an inch or so, and this was the case with U 1. Too, the engine's change in attitude as we crested the summit meant that the water dropped out of sight altogether, demanding quick action with injectors and feedwater pump.

Our first call was at Compiègne. Here Duteil demonstrated a skill with the brake that matched his handling of throttle and reverser. The essence of the use of the Westinghouse brake is confidence and — to use an appropriate Gallicism — élan. Duteil demonstrated both as he brought U 1 to a stop from 75 mph.

The restart was accomplished as efficiently as before. The sequence of starting just described occurs almost as swiftly as it takes to read, and full compound working was achieved by the time the big speedometer needle had reached 25 kilometers per hour (15.5 miles per hour). Gradients were against us now all the way to Busigny, some 112 miles from Paris. Stops were scheduled at Noyon and Tergnier, but each stop was accompanied by such brisk station work that U 1 had little opportunity to show her paces when really extended. If we had set off a few minutes "down" from one of these halts, the sparks might have flown rather more vigorously than they did.

So the miles rolled behind us. Scheduled arrival time at Aulnoye was 3:15 p.m. U 1 was scarcely extended on the last downhill lap from Busigny, yet even with this heavy consist we came to a stand with the platform clocks showing 3:11 p.m. Douillet quickly hopped down and uncoupled, and U 1 moved off toward the shed.

Two big Belgian National diesels were backing on for the next stage of the journey to Brussels, and as the soft sound of U 1's exhaust was lost in the growing chant of twin EMD 567C's, I reflected that nothing could better symbolize the approaching end of the great days of steam in France. I