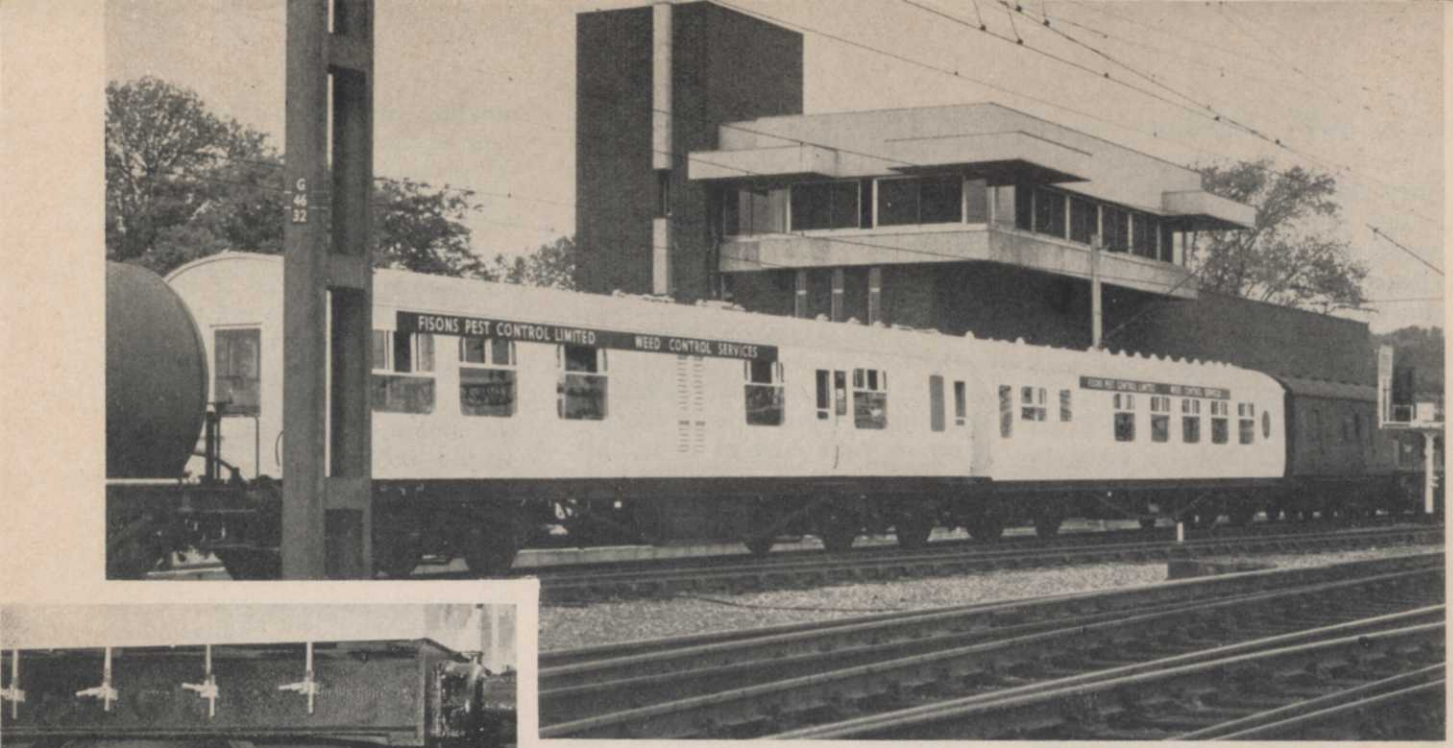

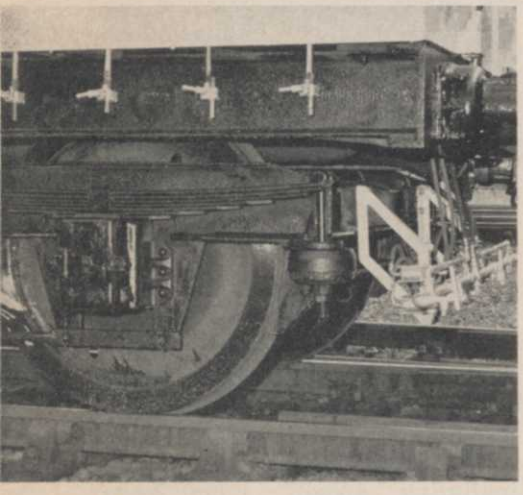

Top photo shows general view of spray coach (left), and living coach (right). Underslung spray boom and adjustable side nozzles are seen in cutout detail.

High Speed Spray Train Knocks Out British Railway Weeds

By
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BRITAIN has an intensive railway system, intensively managed. About one-sixth of the mileage of railroads in the U.S.A. is squeezed into an area less than that of the State of Illinois, and every mile has an average of 27 trains a day passing over it.

Sometimes in industrial areas traffic is so dense, and track maintenance so continuous, that weeds will fail to get a foothold, but this is exceptional. Generally, the moist climate and long growing season encourage a generous cover of weeds across the ballast and adjoining "cess" on either side—unless something is done about it.

The cess (like the berm on American railroads) is at a lower level than the stone ballast on one side and the grass edge on the other, and collects and holds weed seeds, soil particles, and moisture. Not surprisingly, it favors a wide variety of weeds. Fortunately, the stone ballast beneath the track itself has much less moisture and organic matter, and is less of a weed problem.

Broadleaf Perennials Pose Biggest Problem

Regular use of modern residual herbicides on British Railways has greatly shortened the list of offending weeds, which are now mainly broadleaf perennials, often with roots that penetrate beyond the range of surface applied chemicals, or with a creeping habit that allows them to readily invade the cess from the grass edge.

Horsetail, mainly *Equisetum arvense*, is probably the most troublesome of all, with roots several feet below the surface and a high degree of resistance to residual herbicides. Other deep-rooted problem perennials are hogweed cowparsnip (*Heracleum sphondylium*), dandelion (*Taraxacum officinale*), coltsfoot (*Tussilago farfara*), and such creeping weeds as cinquefoil (*Potentilla* spp.), brambles (*Rubus* spp.), and especially field bindweed (*Convolvulus arvensis*). Grasses are seldom a problem, with the possible exception of couchgrass (quackgrass, *Agropyron repens*).

The range of weed species found and their susceptibility to herbicides is only part of the problem of railway weed control, which is as much concerned with application equipment, chemical supply, and above all with the varying daily and seasonal demands of railway traffic.

On the busy lines surrounding London, a very early start is needed to avoid rush hour traffic. We are typically on the job around 1:30 a.m. and finished with these lines by 5:30 a.m. There is a somewhat different, but no less urgent, traffic problem on Britain's newly electrified trunk route from London to the North via the west coast. One hundred and forty trains a day, most of them travelling at nearly 100 m.p.h., do not leave much time for a leisurely spray train, even though we have increased the speed of spraying up to 50 m.p.h. when necessary.

Mechanization, Long-Term Contracts Replace Hand Work

Chemical weed spraying trains have been used in Britain for nearly 40 years, but until recently weedkillers have usually been supplemented with some hand weeding by maintenance gangs. High labor rates and improved herbicides have made hand weeding increasingly unprofitable, and it is now disappearing completely. Mechanized track maintenance and the rapid spread of long-term weed control contracts relieve the railway engineer of most of his previous responsibilities for a specialized technique, which is, after all, little akin to track engineering.

Fisons Pest Control entered into weed control spraying on British Railways ten years ago, coinciding with the introduction of such residual herbicides as the substituted ureas and triazines. Spray trains existing at that time could deal only with solutions and new equipment was needed to suspend wettable powder formulations of the new herbicides.

Until a few years ago, spray trains were hired by British Rail solely to put down specified dosages of furnished chemicals. But, in 1964, the first two long-term weed control contracts on a "supply and apply" basis were introduced.

Once started, these contracts spread rapidly. The miles under contract speak for themselves: 2,000 in 1964, nearly 4,000 in 1965, over 8,000 in 1966, and a further substantial increase expected in 1967. Mechanization of track maintenance and the proven ability of herbicides to control weeds throughout the year from one application have been the main factors causing this change.

Most of the contracts so far let cover between 500 and 1,500 miles of track, each for a period of three, four, or five years. On main lines, they require 98% weed control in the stone ballasted track, and 95% in the cess. British Rail's contribution is limited to programming spray trains once a year over all lines and to providing motive power.

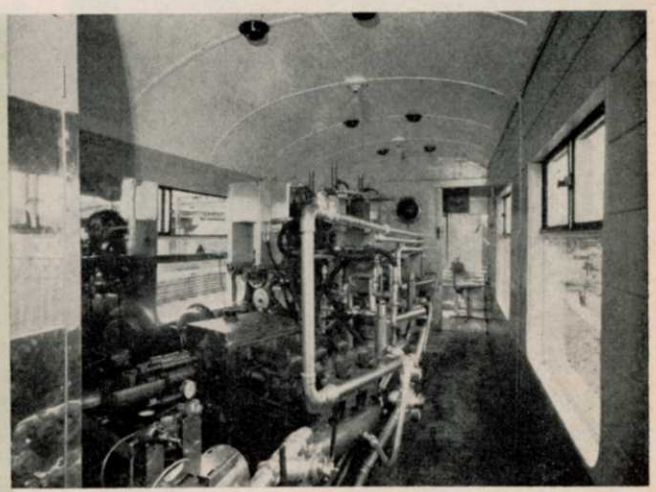
For the chemical supplier, these changes have emphasized two major requirements. First, the contractor must use the most efficient and economical mixtures of chemicals. And, second, he must have equipment to apply chemicals in the right place at correct dosage rates, and at all practicable speeds.

Chemicals we use are mainly atrazine plus amino triazole, with other additives when weed conditions demand them. Rates of atrazine application vary widely from as little as 3 lbs. active ingredient per acre for purely preventive control in stone ballast, up to 14 lbs. or more per acre when spraying heavy stands of weed in the cess, or berm. Rates are designed to give a full year's control to avoid being called back for expensive touchup treatment with hand sprayers.

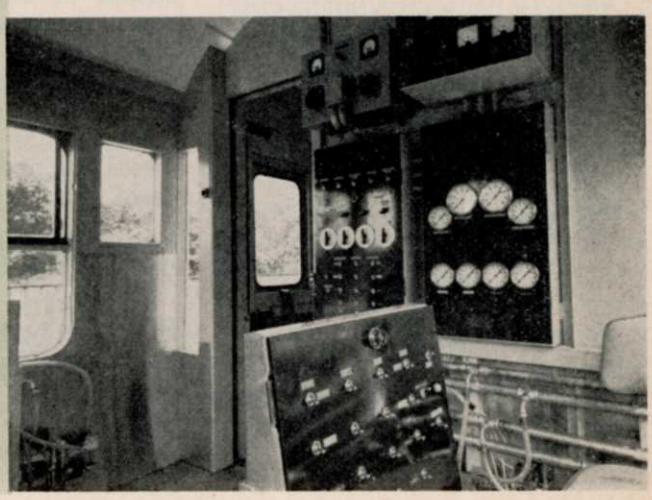
Spraying Delayed Until Midsummer

Weed growth in Britain's erratic climate starts any time from early March to mid-April, but we prefer to spray in June or July when even latecoming species have emerged and can take up the foliar-acting part of

Inside the Spray Coach:



Metering pumps, shown right, measure out precise amounts of chemicals chosen to do the job. Pump output is automatically linked to train speed.



Control room (right) is adjacent to pump room. Electronic operator's panel is shown in foreground. Vertical window spys on trackside ahead.

chemical mixtures in such cases.

No pesticide is fully effective unless applied properly and seldom is this more true than with railway weed control. Aggravating the problem is the frequent conflict with railway requirements for minimum interference with traffic operations. Spraying usually involves a set daily program of 10 or 12 hours at varying speeds with limited stops for replenishing water and chemicals.

Mark IV Train Offers Latest Spray Advances

Successive spray trains developed by Fisons over the last 10 years have culminated in the Mark IV, recently built at a cost of over $56,000. Comprising two 60-ft. coaches and three 40-ton water tankers, the locomotive, two cabooses, and chemical storage cars are supplied by British Rail.

Mark IV has a three-man spray crew and can spray at speeds up to 50 m.p.h. Water capacity is 23,417 U.S. gals., giving a range of 250 miles at an average speed of 30 m.p.h. At the business end of the coach, there is an underslung spray boom plus four long-throw nozzles set at floor level on each side. These can cover up to 10 ft. beyond the coach.

During operation the combined output of water and chemical from each nozzle is constant, giving the same spray pattern and droplet size at all speeds. Low pressures are used to produce large-droplet sprays, and all nozzles point backwards to reduce shearing action of the wind on droplets at higher speeds. Varying wind pressures due to speed, change of direction, etc., can be compensated for at once by manual adjustment of the side nozzles. This design produces a very stable spray pattern that keeps drift to a negligible minimum.

Inside the spray coach, up to three different chemical concentrations are prepared in paired mixing tanks, each tank being used alternately. Any desired combination of chemical concentrations can be selected for various parts of the track and cess.

Chemicals are drawn from the mixing tanks by four metering pumps, which are driven from the coach axle so that chemical output is automatically linked with speed. Though total liquid output of each nozzle remains constant, chemical concentration varies widely with speed to ensure desired spray pattern and chemical volume per acre. All other pumps are driven by a diesel engine housed in a soundproof compartment.

Control Room Operates On Electrical Circuits

The main control room contains nearly all remote controls for operating the train and spraying systems. There is an almost complete absence of levers and valves, all controls and systems being actuated by electrical circuits. Special windows and cutaway portions allow operators controlling the side nozzles to have a clear view of the cess ahead. Any variation in weeds can be met by almost instant changes in chemical type or dosage.

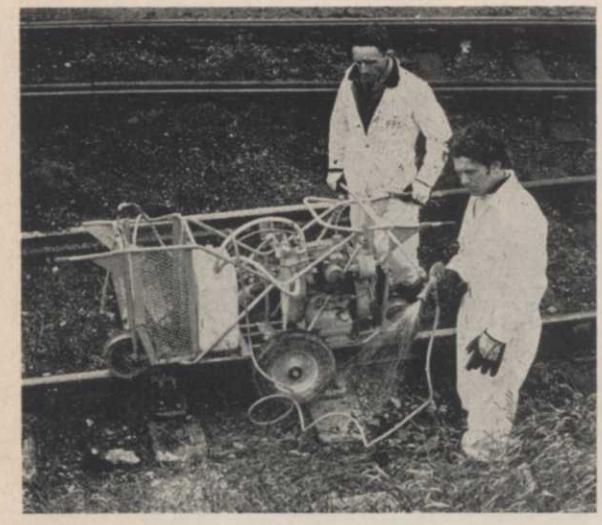
During a seasonal program, the spray crew can be virtually cut off, with "nowhere to go" even though they may cover 5,000 miles in the process. The 60-ft. living coach is designed to provide reasonable comfort for long trips, and contains a well-equipped kitchen, living room, and four separate bedrooms.

Contract Work Extends To Yards and Sidings

The trend towards long-term contracts on British Railways has not been confined to running lines. Weed control on many rail yards and sidings is now dealt with in this way. Here the problem is entirely different. Weeds are similar, but they often grow more strongly in a ballast fouled by soil and rubbish. In yard treatments, we usually use Kagolin, a one-pack mixture of atrazine, TBA, and MCPA, which gives foliar knockdown as well as residual effect.

Access for wheeled vehicles is a major problem in yards. Track centers are only 12 ft. apart, and some or all may be occupied by rail cars, leaving just enough space between for a man to walk. For treating these yards, we have developed a new self-powered barrow sprayer, which carries two 5-gal. cans with enough spray to cover ½ acre.

Output is from a single flood-jet nozzle on the front, which covers a 16-ft. swath and can penetrate between wheels of cars, etc. Alternatively, output can be from a hand spray gun with or without an extension tube. When working between occupied tracks, the barrow sprayer runs on rubber-tired wheels, but if tracks are clear these can be retracted and the sprayer steered along a single rail using the double-flanged wheels in front and back. Carts of the same type are used to take additional cans of spray mix from supply vehicles to sprayers.



Barrow sprayer, here shown in action, was specially designed to meet problem of heavy weed growths in yards and sidings. Operable on ground or track, the highly maneuverable cart shuns obstacles to get at weeds.