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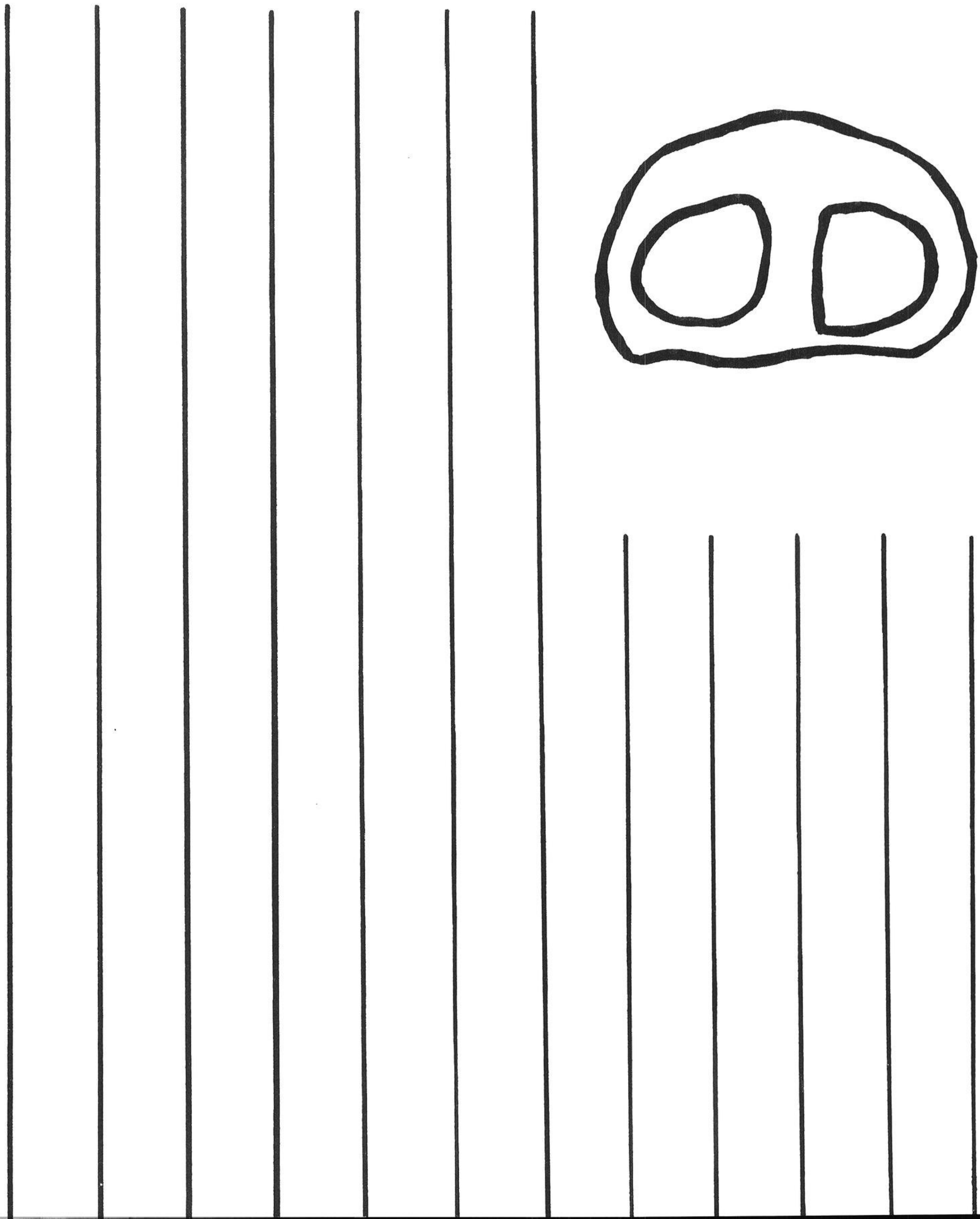
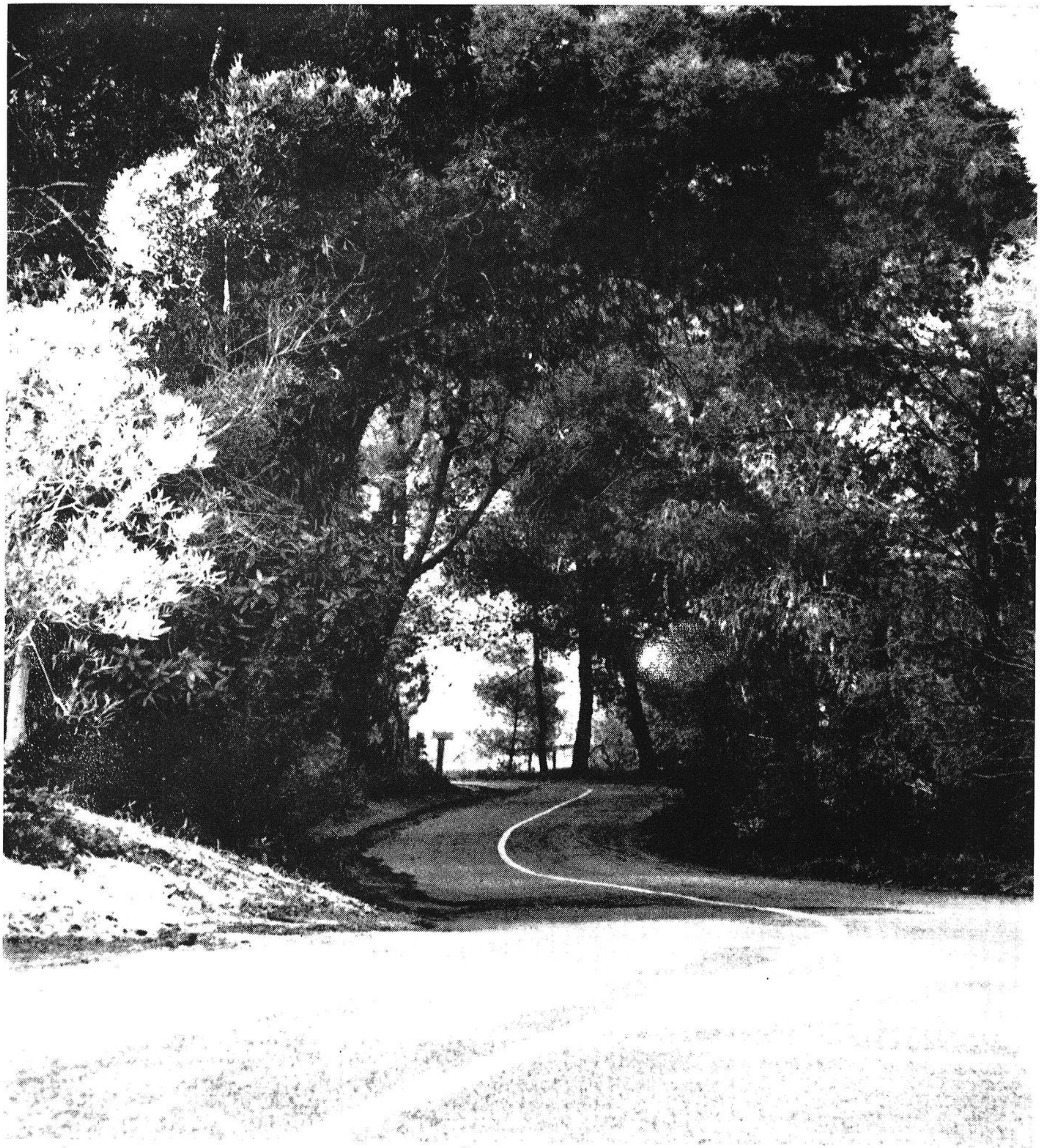
wisconsin engineer





As you can see, you can't see our new telephone lines.

They're underground.

We think America has enough eyesores, so wherever possible we're burying our new cable. And converting old aerial lines.

We already have over 50% of our lines underground. And before we're through we'll have about 92% buried.

We'll never reach 100% because in a few places it's practically impossible to get the cable underground. And in a few other places it's ridiculously expensive.

In the 15 years that we've been burying cable we've gone through hills and high water and turnpikes and mountains.

We've struck oil in Texas (a pipe in someone's backyard). And we've had to get a special repellent to keep gophers from eating the cable.

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And resurrect our scenery.

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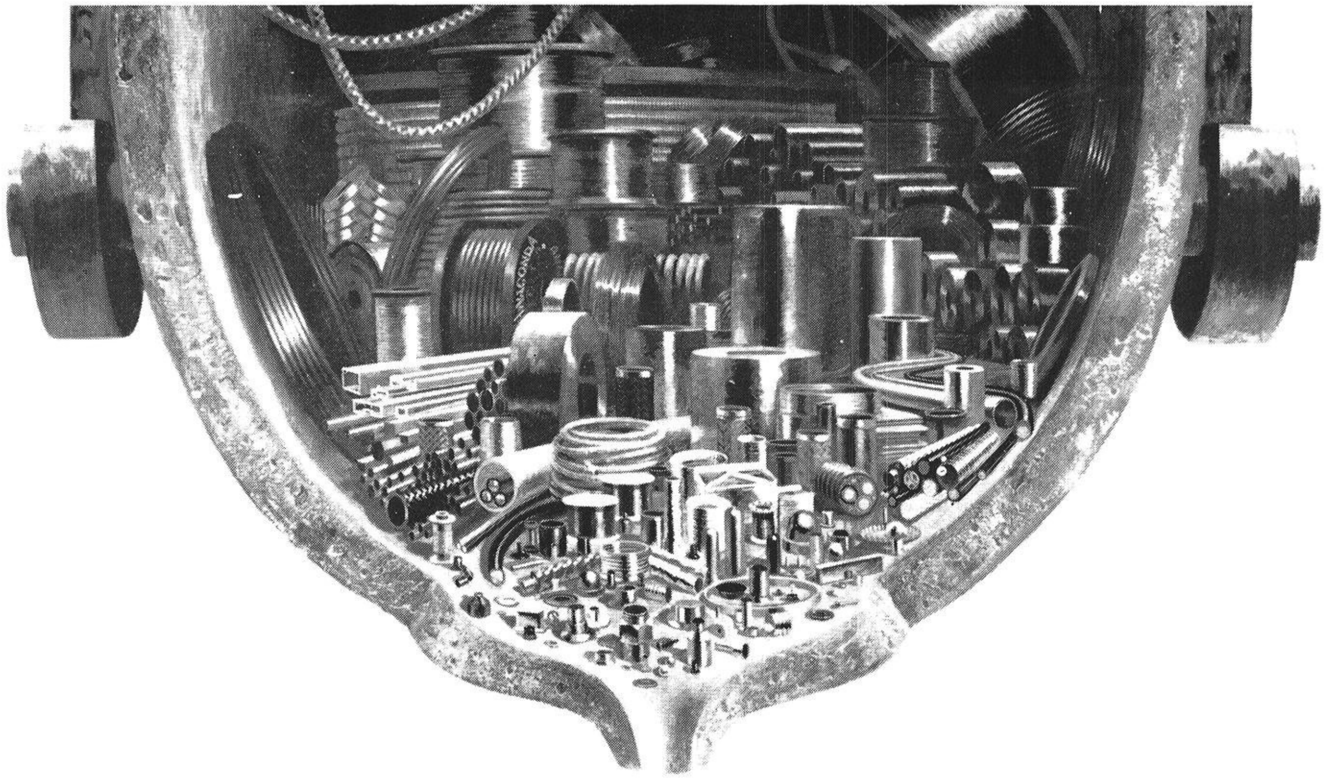

LIVING BIZARRE

March 31: Alternatives in Living

April 1: Crafts Day

April 2: Survival Day

April 3: Alternatives in Recreation

Or: How to be a Student & still Survive

A four day festival designed to help students solve problems like where to live, where and how to eat, and how to make their lives rich, meaningful and fun. Programs and workshops will deal with everything from organic gardening to how to deal with a landlord. Come and help now — we need program planners, people with special interests and skills, poster putter-uppers, etc. If you're interested in helping —

Call 262-2214 or 257-0701 (Ext. 462)

"We are drifting toward a catastrophe beyond comparison. We shall require a substantially new manner of thinking if mankind is to survive." – **(Albert Einstein)**

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wisconsin engineer

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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[CO] > 30 ppm

Madison has a carbon monoxide problem comparable to that in large, highly polluted cities – including New York, Chicago, Los Angeles, Cincinnati, and Philadelphia – according to results of a study announced recently by the University of Wisconsin's Institute for Environmental Studies (IES).

Carbon monoxide (CO) concentrations as high as 160 parts per million (ppm) were recorded in rush-hour traffic along East Johnson St., while the maximum eight-hour average for State St., a shopping area, was 33 ppm. This exceeds the California state air quality standard of 30 ppm.

These concentrations are high enough to cause serious physiological effects in all persons, particularly drivers in heavy traffic, cigaret smokers, pregnant women, and persons with coronary heart disease, severe anemia, cardiovascular disease, or abnormal metabolic states.

Sharon Nicholson Hastenrath, now a graduate student, conducted the study as an honor's thesis for a bachelor's degree in meteorology at Wisconsin.

"We were alerted to the possible magnitude of CO in Madison by measurements taken by the Wisconsin Department of Natural Resources," said Prof. Reid A. Bryson, IES director, who supervised the study.

Mrs. Hastenrath took 568 CO measurements using a stain-length colorimetric test at four principal sites in Madison. Average CO levels at the State St. sampling station were 15 ppm; an east side residential area, 10 ppm; University Arboretum, 6 ppm; and on the roof of a 15-story campus building, 4 ppm. Peak concentrations at street level occur around 8 a.m. and 5 p.m.

In spot checking, she recorded measurements of 13 ppm inside University Hospitals, 44 ppm in a service garage, and as high as 59 ppm on sidewalks and street corners.

Highest concentrations were obtained by measuring CO at car window level while driving in traffic. Levels of 160 ppm were obtained in East Johnson St. traffic, and 64 ppm in East Gorham St. traffic.

Maximum five-minute CO concentrations in traffic in various other cities are: Los Angeles, 81 ppm; Chicago, 78ppm; Philadelphia, 67 ppm; and Cincinnati, 50 ppm.

"Even more important in terms of health effects are the CO levels maintained over periods of time," Mrs. Hastenrath reported. "The daytime eight-hour average on State St. is generally 21 ppm but sometimes is as high as 33 ppm. The four-hour averages vary between 13 and 37 ppm."

By comparison, eight-hour averages for Cincinnati are 21 ppm; Chicago, 44 ppm; Philadelphia, 36 ppm; Los Angeles, 28 ppm.

CO combines with the pigment hemoglobin in blood, displacing the oxygen that hemoglobin normally transports. The CO-hemoglobin bond is 200 times tighter than the bond with oxygen, so even small amounts of CO can hinder the supply of oxygen to tissues.

When the oxygen supply to tissues is reduced, the heart and lungs must work harder, and this may produce a critical strain in persons with heart and lung diseases.

Symptoms of CO poisoning often experienced by people in traffic jams and on freeways include loss of visual acuity, decreased muscular coordination, and increased reaction time, headache, and nausea.

Persons with increased susceptibility to CO may be adversely affected by eight-hour levels such as those recorded on State St.

Mrs. Hastenrath next correlated CO levels with both urban and meteorological factors. She found that CO levels in the Arboretum and on the rooftop are highest during periods of predominantly south and southeast winds.

"The strong correlation of CO at these sites with south and southeast winds leads us to believe that highly industrialized centers to the southeast, particularly the Chicago area, are contributing to Madison's pollution problem," she said.

She carried her study one step further and analyzed visibility data for Madison, Lone Rock (a relatively pollution-free city 40 miles west of Madison), and Chicago. Low visibility in relatively dry air is strongly related to atmospheric pollution.

Low visibility – and hence high pollution – in both Madison and Lone Rock is significantly correlated with south and southeast winds, she found.

"Thus the CO levels in the Arboretum and on the rooftop are very likely influenced by pollution from sources outside Madison," she said.

Prof. Bryson said: "We know we're getting particulates in Madison from Chicago industry, and now we think we can detect CO from Chicago when the winds are from the southeast. This suggests that we ought to find out whether Madison may also be getting sulfur dioxides from there."

Mrs. Hastenrath added: "However, the main source of Madison's CO pollution, 99 per cent of it, is still the automobile. Low route speeds, heavy idling, and large traffic volume account for the high CO levels on State, Johnson, and other busy streets"

[***]

EXPO 71

The biennial U.W. Engineering Exposition sponsored by the College of Engineering, will be held March 26-28. Expo '71 promises to be a fascinating and worthwhile engineering presentation. Student and industrial exhibits will be on display, highlighting recent scientific developments.

Among the industrial exhibits on display, spectators will have the opportunity to view unfamiliar electrical devices and a demonstration of a radiation cooking unit, being shown by Wisconsin Power and Light Co. Other industrial firms scheduled to exhibit include The Bell System, Perfex, Johnson Service, and Par Chemical Co.

With our growning concern for environmental problems, Par Chemical's exhibit should prove especially interesting. Par Chemical produces all-purpose cleaners, laundry detergents, and mild soaps that are 100% phosphate free and completely biodegradeable. Those who decide to try these products will be pleasantly suprised to learn that they cost 1/5 to 1/6 of the price of cleaning products now on the market.

An exhibit which will appear outside the engineering buildings is the car crusher whose picture appears with this article.*

Students from all the engineering disciplines have been preparing for this exposition for over a year. There will be society, group, and individual exhibits representing everything from the most advanced research projects to unusual hobbys.

A student exhibit in the field of biomedical engineering worth looking for, will be a three-legged walking machine. This machine, built to study the problems involved in building exoskeletal structures, may someday provide wheel chair patients increased mobility.

SAE the Society of Automotive Engineers will display an inertia safety belt, a device that combines a head rest, shoulder harness and seat belt into one safety feature.

A communication system using a Laser beam will be exhibited by two engineering students, Wayne Madsen and John Birbaum.

The transmitting apparatus consists of an audio amplifier, a modulator, and the Laser. The receiver is simply a photoelectric cell connected to an amplifier. The Laser is a helium-neon gas type, resonating at a wavelength of 6328 A. The audio amplifiers are a conventional type, leaving only the modulator as unique circuitry. Modulation is achieved by connecting the output of the modulator to the cathode of the Laser. When an audio signal is amplified and impressed on the modulator the intensity of the Laser beam is modulated correspondingly.

The photoelectric cell catching the Laser beam, detects these variations. These variations when amplified reproduce the original signal.

Various experiments with this and related equipment will be conducted during the course of the exhibit.

There will be many more exhibits at the Exposition covering a wide range of interests, everything from project Sanguine to water purity. Special demonstration exhibits will be held in laboratorys in the Engineering Research Building and at the nuclear reactor.

We urge you to attend.

(The related article by D. A. Harkin and W.K. Porter may prove of some interest to those interested in the ecological, economic, and engineering aspects of this exhibit. Incidentally, the City of Madison is considering purchasing a shredder that would compliment the crusher, and making moves toward the elimination of auto junk yards.) Ed.

Methods for Junk Car Removal in Wisconsin

D. A. Harkin and W. K. Porter

INTRODUCTION

One of the blemishes on the landscape of America the Beautiful is discarded autos. These abandoned cars are found scattered throughout the countryside, in auto graveyards and in auto salvage yards.

Besides the aesthetic problem, cars not reused represent a waste of natural resources. Each ton of scrap recycled saves about one and a half tons of iron ore, one ton of coke, and one-half ton of limestone the major ingredients of steel.

Waste has not existed in a narrow economic sense because it has been more "economical" to produce steel from ore than from junk cars. However, this definition of economics fails to consider the costs of scenic degradation and water pollution resulting from mining, and air pollution caused by burning coal when steel is made from ore. Neither does this definition consider the increased beauty of the landscape that results from the removal of junk cars.

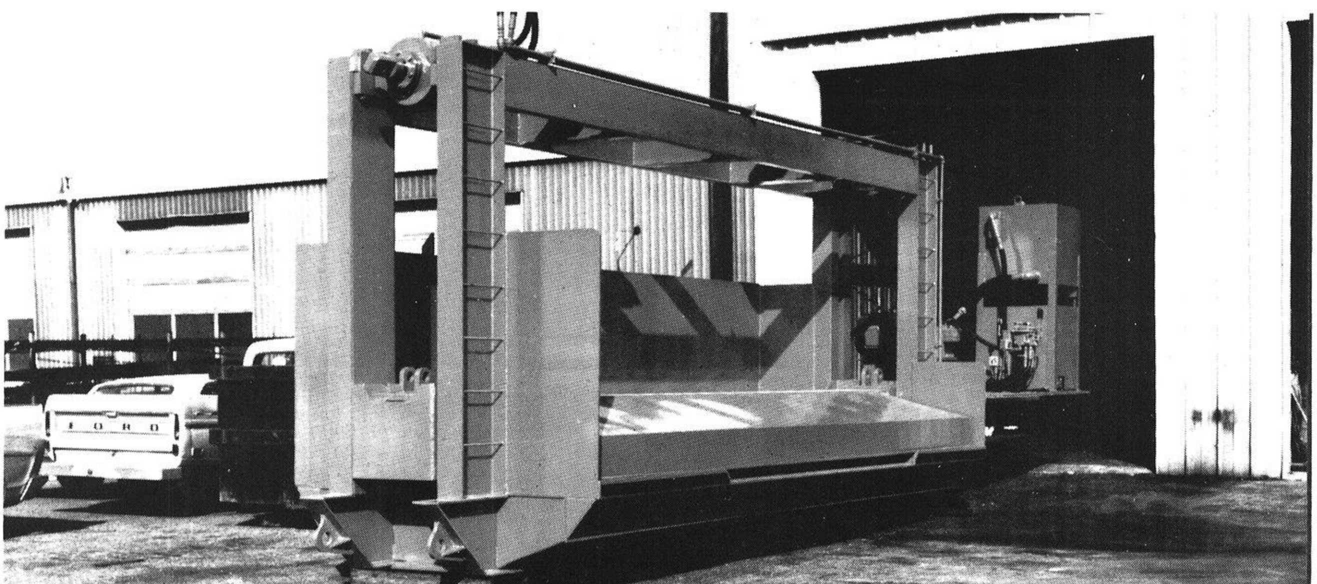
The appearance of our landscape is of concern to the public. The scenic and environmental degradation caused by junk cars and steel production requires public programs to get these junk cars recycled.

This report does not deal with regulations concerning zoning, screening, or operation of junkyards because state and local governments are progressing well on this front. Measures such as revision of discriminatory freight rates for scrap are not treated because they must be handled at the federal level. Instead, this report focuses on state-level programs for reducing the environmental problems, public nuisance and hazards associated with the accumulation of junk vehicles.

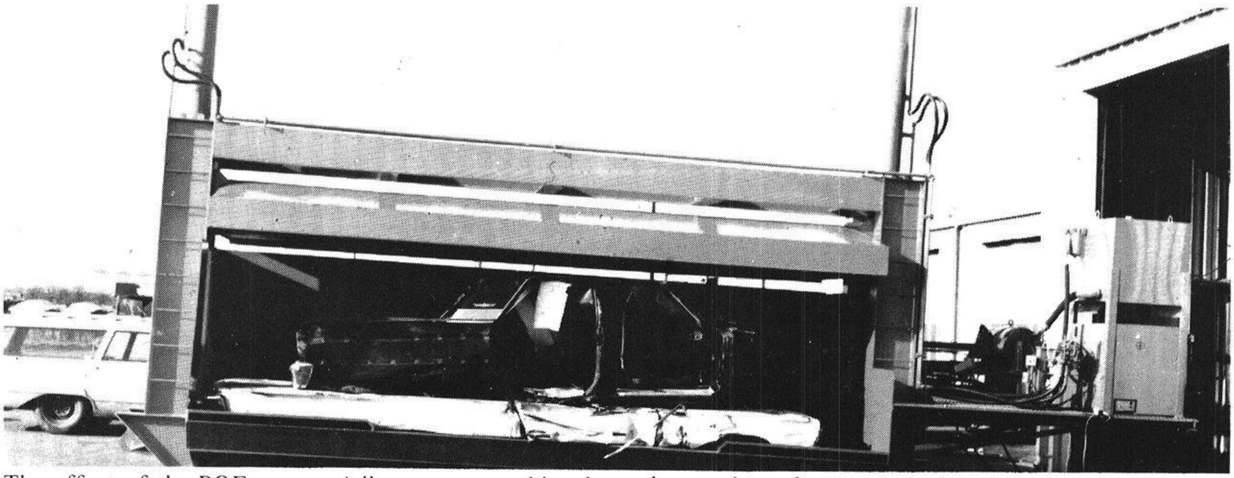
HISTORY

Before 1956, abandonment of automobiles created few problems because domestic steel industries consumed most of the automotive scrap. However, by 1956, the new Basic Oxygen Furnace (BOF) method of making steel decreased the demand for scrap. At this time, the steel industry was investing heavily in ore fields, steamships, unloading facilities, and the BOF. Therefore, the industry became less dependant on scrap as a source of raw material.[1]

Because of the decreased demand for scrap by the BOF method, the price for scrap declined. By 1965, there were an estimated 1.9 million cars lying in auto graveyards or abandoned about the countryside throughout the United States.



Above and on facing page are pictures of the auto crusher that will be displayed at Expo 71.



The effect of the BOF was partially counteracted by the advent of small steel mills with electric furnaces that used scrap exclusively. The electric furnace mills and foreign steel markets have become prime outlets for automotive scrap during the past 12 years.

Within the past year, both domestic and foreign mills have increased their consumption of automotive scrap. This has provided the most favorable economic conditions for the movement of scrap in the last decade.

The history of scrap prices is one of great instability and great vulnerability to general economic conditions and to changes in technology. Of course, the effects of a changing technology are not all adverse. Scrap has continued to move as well as it has despite the long price decline since 1956 because of technological improvements in the scrap -processing industry. Probably the most important improvement has been the development of scrap shredders. But the outlook for the scrap market is necessarily one of continued uncertainty.

STEEL-SCRAP CYCLE

Two important elements in the steel-scrap cycle are the auto salvage yard and the scrap processor.

An auto salvage yard operator is normally the first party to receive a worn-out car. The operator salvages usable parts from these junk cars for resale. Salvage firms are primarily interested in cars less than seven years old because of the value of their salable parts.

The scrap processor receives old cars from the auto salvage yards and prepares the metals for reuse by steel mills, foundries and other smelters. The principal steps in preparation of scrap for reuse are (1) separating and sorting by grade, (2) cleaning, (3) mechanical preparation, and (4) shipping to users. After the scrap is processed by the mill or smelter, it again enters the manufacturing cycle.

WISCONSIN'S PROBLEM

In 1968 Wisconsin had two million registered cars, trucks, and buses. During that year, 180,000 of these were retired from service. Thus, Wisconsin's rate of retirement for 1968 was about 9% of total registration. This is close to the annual national average of 8 to 9%.

Estimates of the junk auto inventory in Wisconsin, as made by the scrap-processing industry, indicate that there are 330,000 junk autos in salvage yards. This is about twice the number of autos junked each year. Again, this is much like the nation as a whole.

Besides the 330,000 cars in the scrap-reprocessing cycle, there are an estimated 200,000 additional vehicles in auto graveyards and scattered about the countryside. These junk cars are outside the scrap cycle. It has been noted that in rural counties there are three times as many junk cars per person as in urban areas [2]. Because Wisconsin's population is substantially more rural than the national population, there will be more of a disposal problem in this state than in the nation as a whole.

POSSIBLE SOLUTIONS

Programs to reduce problems arising from junk cars can be classified as either incentive or regulatory. In general, progress can be expected more quickly if incentives and regulations are used jointly. The use of financial incentives by the government is appropriate where accumulations of junk cars are partly due to government failure to enact regulations prohibiting growth of these eyesores. Proper disposal of a useless car should be the responsibility of the owner. If this becomes a legal requirement, accumulations like current ones, will not occur.

The emphasis of this report is on programs and policies which will facilitate the flow of scrap through the scrap cycle and assure that more cars reach the cycle. Over the past 15 years about 80% of the junk cars reached the scrap cycle. The only problem with this 80% is length of storage. The main concern is with the 20% that are not in the scrap cycle and have accumulated on the landscape.

The following kinds of solutions are considered.

1. Financial incentives designed to increase the number of cars in the cycle.
   a. Vermont Plan – the state guarantees any local unit of government that it will remove any collection of 200 or more cars.
   b. Maryland Plan – the state pays scrap processors a fee for each car processed.
2. Disposal deposit fee which would be returned upon proof of proper disposal.
3. Simplification of title clearance which would make scrapping easier.
4. Financial incentives used to encourage investment in processing equipment.

(Continued on Page 12)

GLOSSARY OF TERMS ON:

Fuels, Combustion, and Air Pollution

(Compiled by Southwest Research Institute, San Antonio, Texas)

TERMS RELATED TO FUELS

Hydrocarbons
Liquid and gaseous substances made up of carbon atoms linked to each other and to hydrogen atoms.

Saturates
Hydrocarbons in which carbon atoms are linked together by single linkages.

Olefins
Hydrocarbons in which some of the carbon atoms are linked together by double (more reactive) linkages.

Aromatics
Hydrocarbons in which six carbon atoms are linked together in the form of a ring and three of the six linkages are double linkages.

Volatility
The tendency of a liquid fuel to evaporate.

Light Ends
Dissolved, normally gaseous hydrocarbon constituents of a liquid fuel.

Reid Vapor Pressure
Pressure produced by a fuel when heated from 32° to 100° F in a closed container.

Gum
Nonliquid residue obtained by evaporating all of a fuel.

Varnish
Nonliquid residue formed from fuel constituents by chemical reactions.

Fuel Detergent
A substance added to fuels to prevent deposition of gum or varnish or to remove deposited gum or varnish in the fuel system.

Gram
One 454th of a pound (about one 28th of an ounce).

mg
Milligram (one thousandth of a gram).

Liter
One and six hundredth of a quart (3.79 liters per gallon).

ml
Milliliter (one thousandth of a liter).

mg/100 ml
Number of milligrams of a substance contained in 100 milliliters of a liquid.

g/gal
Number of grams of a substance in a gallon of liquid.

TERMS RELATED TO COMBUSTION

Air-Fuel Ratio
Pounds of combustion air per pound of fuel burned.

Stoichiometric Mixture
Ideal air-fuel ratio for perfect combustion of fuel to carbon dioxide and water only.

Antiknock Additives
Nonhydrocarbon compounds that increase the octane number of a fuel far out of proportion with the quantity of additive used.

Lead Antiknock
A compound in which lead is a chemically attached part of a hydrocarbon compound, usually as tetraethyl or tetramethyl lead.

Leaded Fuel
Fuel containing lead antiknock fluid.

Clear Fuel
Fuel containing no lead antiknock fluid.

TEL or TML Fluid
Antiknock additive formulations, more than half of which comprise tetraethyl or tetramethyl lead, with the remainder of the mixture comprising chlorine- and bromine-containing hydrocarbon compounds which serve as lead scavengers in the combustion process.

Lead Scavenger
A compound or mixture of compounds that reacts with decomposed lead antiknock compounds in the combustion chamber to form gaseous lead compounds that escape with the combustion exhaust gases. Without such scavengers, much of the added lead would be deposited as solid lead oxides within the combustion chamber, causing spark plug fouling and power loss.

TERMS RELATED TO AIR POLLUTION

Carbon Dioxide (CO_2)
Product of complete combustion of hydrocarbons—a nontoxic gas.

Carbon Monoxide (CO)
Product of incomplete combustion of hydrocarbons—a toxic gas.

Nitrogen Oxides (NO_x);
Nitric Oxide (NO);

Nitrogen Dioxide (NO_2)
Acrid, toxic, and highly reactive gaseous products of combustion of nitrogen (main constituent of air).

Ozone (O_3)
Highly reactive form of oxygen typically present in electric discharges and photochemical smog.

Oxidants
Highly reactive oxidizing substances present in photochemical smog.

Unburned Hydrocarbons
Mixtures of unreacted hydrocarbons and partly burned hydrocarbon compounds which contribute to photochemical smog formation.

Photochemical Smog
Airborne mixture of substances including unburned hydrocarbons, nitrogen oxides, ozone, oxidants, and other irritants formed by complex sunlight-initiated chemical reactions.

Photochemical Reactivity (Reactivity)
A measure of the tendency of a compound to participate in and accelerate chemical reactions leading to the formation of photochemical smog.

Haze
Obscured atmospheric visibility because of the presence of suspended solid or liquid particles.

Smoke
A localized mixture of combustion product gases containing visible solid and liquid particles.

Particulates
Airborne solid or liquid particles that contribute to haze and smog formation.

Polynuclear Aromatics (PNA)
Aromatic hydrocarbon compounds containing more than two six-member rings of carbon atoms. Some such compounds have been shown to be carcinogenic (cancer forming).

Carcinogens
Substances which initiate or accelerate the formation of cancer.

Blowby
A term referring to those gases which leak past the piston rings into the crankcase of a piston engine.

Evaporative Emissions
Those fuel constituents which become airborne as pollutants without having been subjected to combustion in an engine. Such emissions include: fuel spills; fuel tank breathing losses caused by temperature changes and refueling operations; and fuel evaporation in the carburetors of nonoperating engines.

ppm (gas)
Concentration of a gaseous substance expressed as parts (volume of the substance) per million (volumes of gas containing the substance).

ppm (liquid)
Concentration of a liquid or dissolved solid substance expressed as parts (weight of the substance) per million (weights of liquid containing the substance).

ppb
Concentration expressed as parts per billion.

Exhaust Recirculation
An emission control technique in which part of the exhaust gas from the engine is recirculated into the fuel-air induction system to dilute the mixture. The diluted mixture produces lower flame temperatures in the combustion chamber and thereby diminishes the production of nitrogen oxides as exhaust emissions.

Thermal Reactor
An emission control device located adjacent to (or serving as) the exhaust gas manifold into which secondary air is introduced to complete the combustion of carbon monoxide and unburned hydrocarbons.

Secondary Air
Air which does not pass through the combustion chamber, but which is introduced into combustion product gases.

Catalytic Reactor
An emission control device comprising a vessel containing losely-packed solid catalyst particles through which exhaust gases flow.

Catalyst
A substance which causes the occurrence of chemical reactions which otherwise would not occur or would occur to a lesser extent. A catalyst is not consumed by the chemical reactions it controls.

Lean Mixture
Air-fuel mixture containing more than the stoichiometric quantity of air.

Rich Mixture
Air-fuel mixture containing more than the stoichiometric quantity of fuel.

Knock
Undesirable explosive combustion of fuel-air mixture ahead of the normal flame front.

Preignition
Undesirable premature ignition of fuel-air mixture before spark plug ignition (caused by localized hot spots).

Displacement Volume
Cylinder volume purged by moving piston.

Compression Ratio
Ratio of combustion chamber volume when the piston is at the bottom of its stroke to that when the piston is at the top of its stroke.

Critical Compression Ratio
The maximum compression ratio that a particular fuel can be subjected to without igniting in the absence of a spark.

Ignition Delay
The time interval between exposure of a fuel to an ignition source and the resulting ignition.

(Concluded on Page 15)

Junk Autos —

(Continued from Page 7)

VERMONT PLAN

Operation of the Program. The Vermont program is a cooperative effort between the state and local units of government to rid the landscape of old cars. The state had made a standing offer to local units of government to remove any accumulation of 200 or more hulks which a local group collects. The state makes a payment to the local unit, usually a township, to help defray the cost of collecting the cars.

The state removes collections of cars by contracting with commercial operators for the flattening of cars and for transporting the flattened hulks to a scrap market. Contracts are awarded on the basis of competitive bidding. State costs are financed through an annual appropriation from the highway fund.

The local unit of government is responsible for establishing depots where the hulks are collected. These sites must be approved by the state. Collection of old cars by local units is simplified in Vermont by the fact that cars are not titled. The local unit merely obtains a release from the owner of the land where the junk car is located.

Essentially, the Vermont program for car disposal could operate under any technological or marketing conditions. The program subsidizes the cost of transportation. This makes it feasible to move any concentration of 200 or more cars to market from any place in the state. It does not pay the total cost of transporting hulks to the scrap outlet. However, the state pays enough to make it feasible for the commercial crusher-hauler operator to haul them.

Several local factors contribute to the success and economy of the Vermont program. The scrap outlet is in Boston. Since Boston is a seaport, scrap can be readily moved to a domestic market or exported. Also, there is a large scrap shredder near Boston. In addition, portable car crushers have been used in Vermont to reduce the cost of transportation, which is a major factor in the marketing of low-value material.

The contractors are responsible for the preparation and flattening of hulks, and for hauling them to Boston. They are also responsible for cleaning the yard after all cars have been removed. The operator of a portable car-flattener is a small businessman with a substantial investment, amounting to upwards of $150,000, in equipment.

Prior to the enactment of the state air pollution laws, cars were burned before crushing to remove fabric, insulation, and rubber. Since open burning has been prohibited, the cost of removing these contaminants by hand has increased the cost of disposal by at least $3 per car.

Results of the Program. The legislation that initiated the Vermont program was passed in 1968. By December, 1969, 32 contracts had been completed with local units of government. This resulted in the removal of about 13,000 cars from all over the state.

The state incurred three kinds of costs in this program. These were (1) payment to the contractor, (2) payment to the local unit of government for cars collected, and (3) administrative costs. The average payment per car to the contractor for 13,150 cars was $8.56 and to the local unit $.65, while administrative costs were $.69. The total state cost was $9.90 per car. The costs for removal vary with the distance of the cars from the scrap market. Before the no-burning laws were enacted, the costs ranged from $3 per ton for a 100-mile haul to $7 per ton for a 200-mile haul. Since a car weighs about one ton, the cost per ton and per car is about the same

The State of Vermont recently received bids for the removal of cars collected since September of 1969. The most favorable bid was an offer by the contractor to pay $1 per ton for all cars removed. During the first year of the program, the state paid contractors about $8.50 per ton. This very favorable change appears to reflect the substantial increase in scrap prices, and the increase from one to four in the number of contractors bidding for the state contract.

Evaluation of the Program. The effect of the Vermont program is to pay commercial haulers only the amount required to bring cars within their economic reach. Furthermore, the Vermont program involves only those obsolete cars which would not otherwise find their way into the scrap cycle. The recent payment of $1 to the state per car might seem to indicate that there is no need for a state program in years when the scrap market is favorable. However, this is not so. There will continue to be cars abandoned that are not within the economical reach of the scrap market, because wide dispersal will make them too expensive to collect.

One of the attractive features of the Vermont program is that, administratively, it was easy to start. It will also be simple to end, if scrap prices and regulations prohibiting improper disposal of cars combine to make the program unnecessary. The program can be terminated simply, because it deals only with those cars outside the scrap cycle. This program does not give rise to the same kind of dependency on the part of commercial operators that results from many subsidy programs. The program depends entirely on contracts with the private sector for flattening and hauling. State contracts account for only one fourth of the volume of business done by one contractor in Vermont.

The Vermont program also has the advantage of being a joint effort between the state and local governments. As such, it results in a reasonable distribution of costs and benefits. That is, benefits accrue to the local community and to the public, and both share in the cost. Local government is now more aware of the problem and can be expected to use its regulatory authority more vigorously in the future to prevent improper disposal of cars.

The Vermont car disposal program would provide a financial carrot to accompany a regulatory stick in a two-pronged attack on he problem. Whether the new public awareness of responsibility for proper disposal combined with the increasing use of regulatory authority by local governments will be sufficient to prevent future recurrence of the problem is questionable. Further measures may be required to assure that proper disposal is a cost and responsibility of car ownership. A disposal deposit, to be paid when a car is purchased and refunded upon proof of proper disposal, could be adopted in addition to the Vermont program. The Vermont program deals primarily with the existing accumulation of old cars. The disposal deposit is aimed at preventing recurrence of the problem.

Application of the Vermont Plan in Wisconsin. Wisconsin is in an excellent position to adopt a program like the Vermont Plan because of the favorable scrap marketing conditions in the state. A rough approximation of potential costs of a program of this type in Wisconsin suggests that they might range from $390,000 to $770,000 per year. If this amount were raised through a fee levied on the two million auto, truck, and bus registrations each year, the additional cost to the state would be only $.18 to $.36 per vehicle. These tenative figures are based on a number of estimates:

i. a previously existing backlog of 200,000 abandoned cars

ii. 38,000 cars abandoned each year

iii. 5 years to clean up the existing backlog

iv. 100-mile haul to market

v. cost of transportation program, $5 per car.

A less optimistic estimate of $10 per car would result in costs to the state of $770,000 per year. These estimates only indicate the general order of magnitude of probable costs. Much would depend on scrap prices and the extent of participation by local governments.

MARYLAND PLAN

The Maryland program for junk car disposal contains a number of provisions. The most important economically is the $5 "bounty" paid to both the scrap processor and the auto salvage yard for each car processed. The other elements of the program are (1) a uniform title-clearance law, (2) a $200 fine for abandonment of a car, (3) a car must have a current registration to be stored on private property, unless the owner of the property is a licensed auto salvage dealer or scrap processor, and (4) an inventory tax ($5 per car for six months) for storage of cars seven years old or older in an auto salvage yard for more than 18 months.

Funds for the bounty payment are derived from an extra charge of $1 on each title transaction, of which there are about 600,00 each year. The Maryland bounty recognizes that the auto problem is to a large degree an economic one. However, the program applies to all cars, including the 80% that are normally recycled without financial subsidy.

The Maryland bounty payment is intended to extend the distance that it is economically reasonable to transport cars to the scrap market. Conceptually, auto wreckers and scrap processors can be expected to pay an additional amount for transportation up to the amount of the subsidy. Under conditions that are less than fully competitive, however, it is questionalbe how much of the bounty is passed on and used for transportation costs.

As a result of the bounty, the feasible market area will be extended, but some cars within the area will remain out of the scrap cycle because they are too widely dispersed for collection to be worthwhile. Application of the bounty to the 20% of cars that are outside the scrap cycle goes to the heart of the problem, but only a portion of the bounty will be applied to the cost of transportation – the crux of the problem. Another difficulty is that a specified bounty may be too large or too small to achieve the desired results.

Other aspects of the Maryland program fare better under analysis. Simplification of title clearance was obviously needed in a state where there were 24 different county statutes. The $200 fine for abandoning a car is an appropriate way to impress the car owner with the fact that its proper disposal is his responsibility. However, this may put a heavy penalty on predominantly low-income persons, for whom the fine may be out of proportion to the offense. The provision requiring the car owner to have current registration in order to store the car on his property is a legal reinforcement of local regulations regarding storage. The antistorage provision, of course, increases the incentive to abandon cars on public streets. The inventory tax on cars stored by auto wreckers for more than 18 months strongly reinforces the regulations requiring screening of salvage yards. It should effectively prevent operators from storing cars in anticipation of a rise in the price of scrap. There is considerable evidence of such inventory speculation in certainlocations.

DISPOSAL DEPOSIT

The concept of a disposal deposit is to give potential value to a car and to provide an incentive for the owner to dispose of it properly in order to get a refund on his deposit. The disposal deposit would require payment to an escrow fund on each car. The payment would be refunded on presentation of proof that the car had been properly disposed of. The concept of a disposal deposit apparently has not been put into effect anywhere in the United States. However, it has been the subject of legislative consideration in Wisconsin.

The disposal deposit should be a good companion measure to the Vermont-type program. The Vermont program is aimed at removing cars that have accumulated. The disposal deposit would prevent recurrence of the problem. The disposal deposit can be considered as an alternative or supplement to (1) regulation under hazard and nuisance concepts to prevent storage on private land, (2) the requirement of current registration for storage on private land (except by auto salvagers), and (3) penalties for abandonment on public or private property. All of these have the effect of preventing accumulations of cars and forcing them into the scrap cycle.

There are a number of possible variations in the disposal deposit. One possibility is the application of a disposal deposit only to the purchase of new cars. The escrow fund would be sufficient to make payments on all cars so long as new car sales exceeded retirements. However, a large reserve would be required to make the payment on the cars that would be attracted out of storage by the offer of this refund. Another variation in the policy would be to require the deposit to be paid upon purchase of either a new or used car. Yet a third variation would be to require the disposal deposit to be made on all vehicles licensed in one year and thereafter only on new-car sales. In this way, every car owner would immediately become aware that his car would be worth at least the amount of the deposit upon its proper disposal. On used-car sales, the deposit would transfer with ownership. This third variation would result in a substantial reserve in the escrow account which might be used to help finance junk-car roundups under the Vermont-type program.

TITLE CLEARANCE SIMPLIFICATION

None of the auto salvage operators recently interviewed considered Wisconsin's procedure for title clearance to be an impediment to their business. In dealing with a low-value material, however, any unnecessary impediment should be eliminated. Automobile titles are intended to protect the ownership of a substantial piece of property. Title registration assures that the owner gives his permission for the transfer of his property. This makes theft difficult, and helps lien holders to collect amounts owed them. As the value of a car approaches zero through wreck or wear, the cost of title clearancel clearance approaches the value of the property itself. Wisconsin law provides a simpler procedure for cars valued at less than $100 than for more valuable cars. However, it might be appropriate to eliminate title clearance for low-value cars entirely.

Model legislation proposed by the Institute of Scrap Iron and Steel would exempt from title clearance vehicles transferred to a scarp processor which are "discarded, abandoned, or in a wrecked, dismantled, or worn-out condition and unfit for operation . . . and not displaying a current license." The U.S. Department of Commerce has suggested similar legislation.

Chicago has had a major problem with abandoned autos. Even though the impoundment period was reduced by law from 30 to 15 days in 1969, the shortage of impoundment space has made it necessary to take a calculated legal risk and move some cars directly from the streets to car shredders.

In doing this, the city has exposed itself to the possibility of lawsuits for the value of cars erroneously destroyed. But after the hauling away of 10,000 cars under this program, there has been no protest, and no court cases are pending. Chicago's case is extreme, but it illustrates the inappropriateness of applying title procedures to property of little or no value.

ASSISTANCE IN FINANCING CAR SHREDDERS AND CRUSHERS

One alternative state-wide policy would be to facilitate the use of portable car flatteners and car shredders by lending money to operators at low cost. Such a policy has been suggested in federal reports, and one Wisconsin processor has suggested that tight money has been a major obstale to progress in the installation of shredders. Unquestionably, the current high interest rates have increased the cost of ownership of these already expensive machines.

The application of a selective subsidy such as low-cost money for the purchase of flatteners and shredders may be justified as an antidote to the ugliness of old cars strewn about the landscape. But implementation of such a subsidy must be carried out with the recognition that the public may be putting its money in the wrong place, either because of the low cost-effectiveness of the subsidy or because of technological obsolescence of the method subsidized. It should be recognized that technology is constantly changing. For example, the development of prereduced ore pellets and the acceptance of unburned bundles by some steel mills may affect the demand for shredded scrap.

CONCLUSION

This report has been concerned largely with alternative programs for attacking the problem of junk cars at the state level. The junk-car problem stems from economic factors, and programs to increase the number of cars in the scrap cycle are therefore of primary concern. Thus, we have excluded detailed consideration of the regulatory authority to control storage of old cars on private land and to control the operations of auto salvagers and scrap processors. As progress is already being made in the use of regulations, the greater need appears to lie in increasing the flow of scrap.

The general outlook for the consumption of old cars in the scrap cycle is for continuance of the instability characteristic in the past. The production of steel will probably always fluctuate widely because the steel industry is a capital goods industry and very sensitive to changes in the economic climate. The competitive position of scrap versus ore can be expected to fluctuate according to technological changes in steel production and in scrap processing. Thus, dependence on the free play of economic forces to clear away old cars is likely to be unsatisfactory. Public programs are needed to facilitate this process if the ugliness of accumulations of old cars is to be minimized.

Two major aspects of the junk car problem are the need to recycle cars that have accumulated over the past 15 years and the need to prevent recurrence of the problem. A transportation program of the Vermont type is aimed at reducing the accumulation of junk cars. In Vermont, the state contracts for the flattening and hauling of accumulations of old cars. The program pays only the additional amount required to make it feasible for commercial car flatteners and haulers to clean up the existing backlog of cars.

Recurrence of the problem can be prevented through the use of such financial incentives as disposal deposits and bounty payments. Other preventive measures would include (1) requiring a current license for storage of a car on private property, (2) prohibition of storage under nuisance concepts, (3) penalties for abandonment, and (4) control of inventories of auto salvage yards by regulation or an inventory tax.

A bounty payment for the final processing of all cars registered in Maryland is applied to the 80% of cars that would be recycled even without such a subsidy. Simplification of title clearance warrants consideration, but this would be of minor significance in eliminating the problem of junk autos. An additional measure that makes proper disposal a normal responsibility of car ownership and that would penalize those who fail to dispose of their cars properly is the disposal deposit. Although the disposal deposit has not been applied, it warrants careful consideration as a means of preventing future accumulations of junk cars. [***]

1. Institute of Scrap Iron and Steel, Inc. 1970. Lanscape 1970. Proceedings of a National Conference on the Abandoned Automobile, p. 11.
2. U.S. Bureau of Mines. 1967. Automobile disposal, A national problem. U.S. Dept. of Interior, p. 8.
3. Ibid., p. 18.
4. Ibid.
5. Business and Defense Services Administration. 1969. The auto wrecking industry. U.S. Dept. of Commerce. Unpublished draft report.

U.W. NEWS

engineering

Two faculty members of the University of Wisconsin College of Engineering at Madison are trying to find some answers to the problem of contaminated water flowing through the refuse in the Nation's dumps.

Profs. Robert K. Ham and William C. Boyle of the Civil Engineering department received a research grant from the U.S. Department of Health, Education, and Welfare for a study of "The Treatability of Leachate from Sanitary Landfills."

"Leachate" is contaminated water which seeps down through refuse hauled to the landfills into the soils beneath and surounding them.

The researchers explain that one of the problems in locating sanitary landfills for solid waste disposal is that sites which are suitable for other reasons may not be suitable from a hydrogeological standpoint. If satisfactory methods for treating water which may be contaminated by percolation through the refuse can be devised, previously undesirable sites may be used, they say.

Some experiments in collecting and evaluating leachate have been made by Prof. Ham as part of the Heil Gondard-City of Madison demonstration project where water was collected by a large plastic sheet placed under 5-6 feet of refuse. The water was analyzed for volume, temperature, conductivity, chemical oxygen demand, pH, dissolved oxygen, biochemical oxygen demand, various forms of nitrogen, phosphate, chloride hardness, and alkalinity.

Although the composition and concentration of the leachate may change somewhat depending on climate, refuse properties, and so forth, these studies form a logical basic for the next phase of work: determining the implications of treatment by municipal sewage plants and by separate treatment in a special process.

Ham and Boyle point out that the most desirable means of treatment would be simple discharge into a municipal sewer.

Their project includes an analysis of such a procedure, including determination of the effects on conventional activated sludge or trickling filter treatment processes.

In the absence of a sewer, a special treatment process must be used, and processes to be investigated for this purpose include lagoons, chemical precipitation, floculation and sedimentation, they explain, pointing out that efficiencies of leachate treatment and critical characteristics of leachate will be determined for several process patterns.

[***]

more . . . . .

The University of Wisconsin College of Engineering is sixth among the nation's schools in number of its graduates who have gained listing as "Engineers of Distinction" by the national Engineers' Joint Council.

Forty-nine UW-Madison graduates are included in the listing.

The council published the list, along with short biographies of 1,500 American "Engineers of Distinction," to remedy the fact that "engineers who have assumed leadership roles in the profession remain largely unknown."

The list was limited to winners of national awards and officers, directors, and chief staff officers of national engineering societies, which the council admitted was a "narrow criteria" that would exclude" many eminently worthy members of the profession."

The compliation shows that, of the 1,513 engineers listed, 1,026 received their first degrees from state and land-grant institutions. All the top 10 institutions in terms of engineers listed were member institutions, as were 14 of the top 20. Altogether, 31 of the 52 institutions that awarded the baccalaureate degrees were state and land-grant instutions.

Only universities ahead of Wisconsin were the Massachusetts Institute of Technology, Illinois, Michigan, California at Berkeley, and Purdue. [***]

TERMS . . .

(Continued from Page 11)

Octane Number
A measure of knock resistance of a fuel based upon experimental tests. There are several methods of determining octane numbers, each of which gives a different value. The three most common methods are shown below.

Research Octane Number
The octane number most commonly used to describe gasoline knock resistance. It is determined by testing the fuel in a special single cylinder laboratory engine. This test method tends to rate fuels with a higher octane than they provide in actual service.

Motor Octane Number
The "motor" method is also conducted with the same kind of single cylinder engine as used for the "research" method. This test is more severe, however, and results in a lower octane number rating—usually some 5 to 10 numbers less than research numbers.

Road Octane Number
A measure of the fuel octane number required by a vehicle engine, using a special road test procedure. This rating gives the true octane number of the fuel as interpreted by the automobile engine. This number is usually between the "motor" and "research" method numbers.

Octane Number Blending Stock
High octane-number hydrocarbon compounds or mixtures used for blending with base fuels for increasing the octane number.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When you can hardly hear yourself think, it's time to think about noise.

Noise won't kill you. But before it leaves you deaf, it may drive you crazy.

Noise is pollution. And noise pollution is approaching dangerous levels in our cities today.

People are tired of living in the din of car horns and jackhammers. They're starting to scream about noise.

Screaming won't help matters any. But technology will. Technology and the engineers who can make it work.

Engineers at General Electric are already working to take some of the noise out of our environment. One area where they're making real progress is jet-aircraft engines.

Until our engineers went to work on the problem, cutting down on engine noise always meant cutting down on power. But no more.

GE has built a jet engine for airliners that's quieter than any other you've ever heard. A high-bypass turbofan. It's quieter, even though it's twice as powerful as the engines on the passenger planes of the Sixties.

And NASA has chosen General Electric to find ways of cutting engine noise even further.

It may take an engineer years of work before he can work out the solution to a problem like noise in jet engines. And it may be years before his solution has any impact on the environment.

But if you're the kind of engineer who's anxious to get started on problems like these and willing to give them the time they take, General Electric needs you.

Think about it in a quiet moment.
Or, better yet, a noisy one.

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