

equipment should be a few heavy-type V-plows for heavy drifts and very deep snows.

Ice is recognized as a very distinct hazard and should be removed as quickly as possible. Sand, stone grits, or cinders should be stored at strategic points on curves and grades and applied promptly when ice forms. Calcium or sodium chloride is recommended as an admixture to the stock piles to prevent their freezing and to aid in embedding the grit particles in the icy surface.

High speed spreaders are recommended which will handle mixtures of grit and either calcium or sodium chloride. These can be used on greater lengths of road. After the chemicals have sufficiently melted the ice, it can be removed with a grader, thus eliminating the hazard entirely. The greatest effectiveness gained from any method of ice control depends on promptness.

*Emergencies.* Under this heading are such activities as adequate warning at flooded locations, removal of debris after storms and wrecks, and in many cases first aid to the injured.

The whole maintenance field has many problems and ramifications which are not apparent to the layman.

## NEW DEVELOPMENTS IN ROAD MAINTENANCE EQUIPMENT

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It has often been said that there is nothing new. We just discover or take notice of things which have always existed and with which we are more or less familiar but which we suddenly see in a new light. In the matter of equipment, new developments ordinarily mean merely the application of old principles in a new or different way.

It is rather presumptuous for me to attempt to speak to a group so well advised as the county surveyors, county road supervisors, and county commissioners of the state of Indiana, about new developments in road maintenance equipment. I realize that many of you are in daily contact with all types of maintenance equipment, and, no doubt, have been instrumental in the development of some of the most recent and most useful improvements. With this fact in mind I shall attempt to deal with generalities only and trust that there will be frank discussion from this entire group which will result in the maximum benefits to be derived.

I shall first mention motorized equipment, since this is the motor age and the greater part of our equipment is propelled or operated by some type of motor. Before the automobile, truck, and tractor came into general use, the farmer

who could not afford an extra horse for driving purposes had to have a general-purpose horse in his group that could not only take his place at the plow, but also make the necessary trips to market, church, and society gatherings. The problem to decide in that case was whether or not the light road travel was equally as important as the heavier field work or more important. There is hardly a highway maintenance requirement conceivable for which the manufacturer has not provided a special tool or piece of equipment. If your budget allowance is ample and your needs justify the purchase of highly specialized equipment, you will ordinarily find it much more efficient than the general-purpose tool. From an economical standpoint, however, you will not be justified in purchasing a highly specialized piece of equipment for which you will have only a few hours' work throughout the year.

#### MOTOR TRUCKS

Perhaps the most commonly and generally used piece of equipment is the motor truck. Trucks range from the cheapest light runabouts to the heaviest hauling units, and each has its place according to the conditions and problems to be met. The truck that will prove most valuable to a certain county because it has features especially adaptable to the performance of tasks required by that county, may not prove the most efficient for another county in another section of the state whose requirements are quite different. Some of the southern counties have many hills and steep grades, while the northern counties have their snow to deal with. In purchasing a truck, one should have in mind the principal use to be required of that unit and then look the field over for what will best fill the bill. This same consideration should be given in the purchase of other equipment, but is less important, since no other one piece of equipment is capable of the many functions required of highway trucks, including the transportation of men, tools, materials, the towing of other equipment such as graders, maintainers, drags, and the bearing of attachments such as underswung blades, shoulder maintainers, and snow plows. If your truck could be limited to fewer tasks, it would simplify and make much easier your decision at the time of the purchase. Incidentally, it would simplify the manufacturers' problem even more.

Some of the improved features of modern highway maintenance truck equipment are low beds for convenient loading, comfortable cabs with maximum visibility, balloon tires, low ranges of speed through auxiliary transmissions and, perhaps, a more general use of all wheel drive design. Naturally, the motor, axle, hoist, and bed are important items of a maintenance truck. The modern motor equipped with oil bath or wet type air cleaner and better cooling system is capable of greater efficiency. Next to being able to start or move your truck is the ability to stop it when and where you choose. One

should never lose sight of the importance of good brakes either at the time of purchasing or in the actual operation of a motor-driven vehicle. Great improvements have been made in the matter of brakes during recent years and have meant much in the protection of life and property.

#### ROAD GRADERS

Perhaps next to be mentioned in the way of highway maintenance tools, are the grader, maintainer, and various types of blade equipment used in preparation and reconditioning of the road surface. This blade equipment has undergone many changes in recent years, and even at this time there are many different designs and theories of construction, each perhaps with certain features of superiority in the performance of certain tasks. Here, again, the official should have in mind his particular requirements or principal tasks and choose accordingly. Where there is sufficient use to justify the investment, certainly the modern motor-powered grader mounted on inflated tires and power-operated throughout would prove to be a most valuable tool and pay for itself in greater efficiency. This equipment, through its mobility with a traveling speed of ten to twelve miles per hour, is capable of covering wider areas and fits in very well in the northern part of the state as a snow- and ice-fighting unit. Ordinarily, the troubles encountered from snow and ice in Indiana are not continuous, but more or less intermittent. For that reason the truck equipment in this state has generally been found more practical than tractor snow- and ice-fighting equipment. Our recent experience with ice has brought out the need for blade equipment of the grader type, carrying scarifier attachment, and it is necessary that it be capable of covering considerable territory. I feel that the power grader is an answer to this need, and, incidentally, the snow- and ice-fighting possibility takes away some of the argument against advisability of investment in such a costly piece of equipment, since it will not necessarily be idle so much during the winter period.

The modern grader with its blade, scarifier, leaning wheels, and alignment shifted almost instantly through application of power when the operator merely pulls a lever, makes it possible to cut to truer grades and alignment and accelerates and improves the work throughout. Incidentally, the power-control feature can be had on graders that are towed just the same as on motor-driven graders. There are various attachments for graders such as the backslope, and the "Gledhill" for finishing true surfaces. Some of the modern graders are so designed that the main moldboard or blade can be thrust to the side and set at such an angle as to cut the usual slopes specified. This eliminates the need of additional backslope equipment. There is some development at this time in the matter of multiple blades which is intended to fit better the

crown of the road surfaces as they are ordinarily constructed or desired. Blade scrapers operated by underswung attachments to truck frames have undergone many improvements in recent years.

Standardization of blade punching has been of great value to those using several different makes and designs of blade equipment, especially when blade renewal has been necessary. There are several maintainers on the market, each following more or less the principle of the earlier long-base wooden drag with its cutting blades set at different angles, to distribute the loose material back and forth across the road surface and fill up the low spots. These maintainers vary in weight and size, according to the amount of cutting desired and towing power available. There is a berm or road shoulder maintainer which attaches to the truck frame and has proved very efficient in the matter of eliminating ruts along the edge of pavements.

I have mentioned only motor-powered equipment, but fully realize that many localities utilize their local farm teams, both for hauling purposes and to pull the several pieces of maintenance equipment ranging from the simplest split log drag to the heavier graders and maintainers. Certainly there will always be need for the horse-drawn mower in cleaning the roadside, since a man and team can do a better job and reach places inaccessible to a power mower of any size available at this time. When it comes to working around shrubbery, guard rail posts, and like obstructions where standard mowing equipment will not prove practical, I believe there is a small power-operated mower that has proved very efficient.

#### TRACTORS

Speaking of power, it can be had in tractors, both wheel and crawler type, ranging from the lightest of a few horse power to the mighty that are competitors of the locomotive. Tractor motors have undergone substantially the same changes as those for trucks, with, however, considerably more development in the use of the Diesel motor. There is much argument for the Diesel motor, and I believe those interested in efficient power with economical operating costs will do well to investigate this motor when in the market for a tractor. Wheel-type tractors with inflated tires have come into general use recently and are preferred in maintenance work, since much of our road mileage is paved in one form or another. The crawler tractor will always prove popular for heavy-duty work and has many advantages where the going is hard and the traction poor. Most tractors are or can be equipped with power take-off, which is very practical in operating auxiliary equipment such as stone-crushers, gravel-screening plants, belt conveyors, etc. Tractors are designed and built to withstand hard usage, being able to grind away for hours at low

speeds on heavy drag, which feature justifies their purchase and makes it impractical to substitute for them with a truck, even though the truck can sometimes do this same work for short intervals.

#### BITUMINOUS EQUIPMENT

No maintenance yard would be complete without some sort of tar kettle for heating bituminous material to be used in making patches, pouring cracks, painting raveling surfaces, marking centerlines, and repairing wood-block bridge floors. Much time has been saved since the wood and coal fire boxes have been replaced with gas burners and this equipment has been made more portable with the installation of inflated tires. Many accessories have been added to tar kettles in the way of pressure pumps for use with spray hose, and better draw-off facilities. Kettles have been made safer by providing proper overflow and tight-fitting lids to guard against the scalding of operators.

In connection with tar kettles and the centerlining of pavements, the state highway commission has developed and had manufactured a centerline machine which, no doubt, many of you have seen. We feel that this centerline machine has many advantages over anything of the kind that has been produced to date.

A comparatively new development in the handling of bituminous materials for surface treatments is the use of trailer distributors. This equipment proves of special advantage where long hauls are encountered.

Road resurfacing machines consisting of a series of discs have been found quite serviceable in the matter of removing corrugations from "fat" bituminous surfaces. This same equipment will serve to roughen a slippery bituminous surface and has some value in ice removal.

High joints and the equally troublesome matter of cracks being built up with bituminous filler have received considerable attention, and at this time there are several machines on the market that are intended to grind down and smooth out these irregularities in cement concrete pavements. It would seem that much development must be made yet before this equipment is ready for general use.

A most valuable and inexpensive piece of equipment for use of maintenance forces that has only recently come to light is the small portable roller. This eliminates the drudgery of hand tamping and does away with the alibi for rough patching. This little roller can be towed behind a truck or automobile by merely plunging the tongue in the opposite direction, which lifts the load on inflated tired wheels that are carried on each side of the roller on an axle that is off-center when rolling. When operating, the roller is attached to front of light truck or even an automobile, where operator can see as he drives forward and backward over the patch or area

to be ironed out. It is difficult to do good patch work by hand tamping and frequently isolated spots have been neglected because of inability or cost required to move a large roller to some out of the way location for only a few square yards of surface.

The mud jack is another major piece of equipment that has been in existence for only the past few years. It has considerable merit where properly used, but is not a cure-all for irregularities in pavement surfaces. Perhaps its greatest value is for use at either side of structures where there usually is some settlement of fill, resulting in voids under the pavement.

There are many concrete mixers to choose from, and recently some development has been made in producing a mixer especially adapted for preparing bituminous patch material.

All equipment needs to be repainted from time to time. Any surface to be properly painted must first be thoroughly cleaned. The modern way to apply paint is with a spray or paint gun. Some such equipment will prove quite serviceable to any maintenance organization, since it will not only expedite work of painting equipment and signs brought into the shop, but with portable air compressor and sand blast attachment will be especially valuable in repainting structures.

One very important thing I have not mentioned as yet. You should remember that all equipment is subject to wear and that the best will require some servicing and replacement of parts. Buy with an understanding as to the ease or difficulties to be encountered in securing replacement of parts.

There is a world of good equipment. The American people are machine-minded. Often there are two or more articles between which you are unable to choose. In that event, the salesman who has approached you in the best manner is most likely to get the business. I recommend that each of you spend all the time you can in the armory looking over the splendid display that has been brought here at great expense this week for your convenience. You will find many of the best manufacturers of road equipment represented here with extensive lines and a group of competent, courteous salesmen ready to answer all questions and explain the merits of their equipment to you.

## PREPARATION OF A COUNTY MAP

By George Gault, Wayne County Surveyor and  
Road Supervisor

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Before starting a county map it must be determined just what information the map is to show, so that it may be made to as small a scale as possible without difficulty in reading. We find that a large map is inconvenient to handle in the field,