Magic Carpet of Paper for Gardens

Agronomy

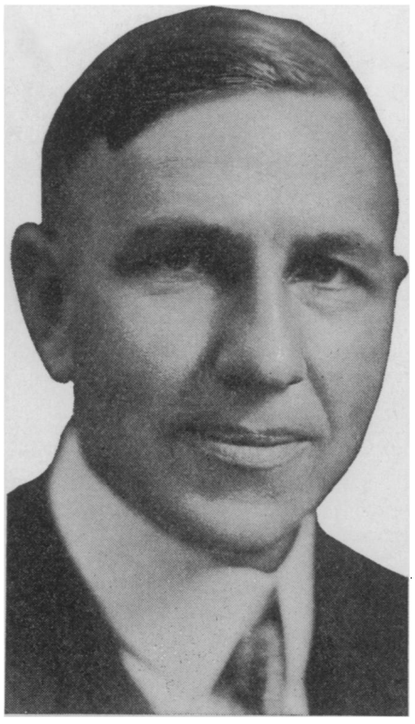
By Frank Thone

Spring is here. The March winds have cleared off the last of the snowbanks, and for weeks the early bird has been making life miserable—and brief—for the early worm. The smell of fresh-turned earth is in the air, as the farmer soberly follows his plow around the field, and the suburban city man, with the call of his grandfather Adam strong upon him, spades away industriously in his back yard. Not even the sight of fat, writhing angleworms, which in his boyhood would have turned him from his gardening to the even more primitive nature-occupation of fishing, now affects him. He leaves them to the robins. He is going to have a *garden!*

But weeks hence, as the weather warms up, his ardor will cool. Then will he feel the curse of Adam: thorns and thistles will his garden bring forth to him, and every time it rains the soil must be pulverized again lest it cake brick-hard and evaporate out all the precious moisture. Verily, only in the sweat of his face will he eat bread—or lettuce, or radishes, or beans, or beets, or kohl-rabi, or any other kind of garden sass. There is joy in spading the good brown earth, but nothing but lumbago and grief in pulling weeds or wielding the dusty hoe. The farmer and truck-raiser, who have to depend on their labor for their living, perspire away philosophically, but the suburbanite, who began his gardening more or less for pleasure and is too proud to quit even after it has ceased to be fun, sighs and wishes that Ancestor Adam might have found some way of sneaking back into that delectable garden where there weren't any weeds and the vegetables grew themselves without needing to be hoed.

The Garden of Eden will never be refound or regained, but the curse of Adam can at least be mitigated. Gardening will always be labor, but much of the back-aching, heart-breaking drudgery can be taken out of it. And sometimes the trick is so simple that we stand and gape and wonder why nobody ever thought of it before.

The latest dodge for taking some of the sweat out of gardening is such a trick. And curiously, too, it was first thought of and put to use in the tropics, whereas we are accustomed to think of improvements being devised in the more energetic cooler climates and later on introduced into tropical practice. Still, why shouldn't the tropical planter think of sweat-sparing methods? Where it's 100 degrees in the shade—and very little shade—it's dollars in the pocket if you can save your field hands from the risk of sunstroke.



Dr. L. H. Flint, of the U. S. Department of Agriculture, who has raised wonder crops of vegetables under the "magic carpet" of asphalted paper

This tropical trick that has been brought in from the pineapple plantations of Hawaii for the possible benefit of mainland American gardeners has been talked about under the intriguing and romantic name of "the Magic Carpet." In sober actuality it is nothing more romantic than asphalt paper, more or less like the kind used in making roofs or for insulating the walls of frame houses. But magic results sometimes come from very commonplace things, like golden eggs from gray geese.

So it has been in the present instance. Some years ago the pineapple planters of Hawaii learned that they could greatly increase their yield per acre by planting their pineapples through holes in a specially prepared paper laid on the ground. It reversed the usual role of roofing paper; instead of keeping the moisture out it kept it in. In addition, it kept the warmth in the soil, thus providing hothouse conditions for the roots of the pineapples at least, and considerably speeding up their rate of growth.

The trick worked so well that the planters bragged about their "Magic Carpet" in advertisements, and one of these advertisements caught the eye of Dr. L. H. Flint, of the U. S. Department of Agriculture. If these paper carpets bring such golden returns in Hawaii, he asked himself, why shouldn't they be good for garden stuff in general, here at home? And being both by temperament and professional occupation an experimenter, he went forth to try it.

He tried it on a much grander scale than the average backyard gardener would have an opportunity to make similar tests, for he had a portion of the huge Federal testing farms at Arlington at his disposal, and all the rolls of paper he wanted, within reason. So he planted plots of all imaginable kinds of garden truck, carpeting the soil on either side of the rows with the asphalt paper. He also planted similar plots of the same kinds of vegetables in the ordinary way, without the protecting paper carpet. Then as the various crops matured he harvested from both the experimental and the uncarpeted "control" plots at the same time, weighed up what he got, and compared results.

His figures showed that this system of paper mulching works quite as well under the conditions of his experiments in the temperate zone as it does in the tropical Hawaiian climate. Increases in yield ranged from a modest 11 per cent. in green peas and 14 per cent. in lima beans to 267 per cent. in watermelons and 516 per cent. in spinach. Crops were increased between 30 and 80 per cent. in green beans, squashes, cantaloupes, pumpkins, cabbage, carrots, okra and tomatoes. They were doubled or better in cucumbers, lettuce, sweet potatoes, beets, green corn and several other vegetables. Two late plantings of green corn were more than trebled. Treble increases resulted also in a late planting of green beans. Potatoes showed a crop increase of 377 per cent. over the yield from the "uncarpeted" plot. The only failure resulted with peanuts, where only half a crop was har- (*Turn to next page*)

Magic Carpet for Gardens—*Continued*

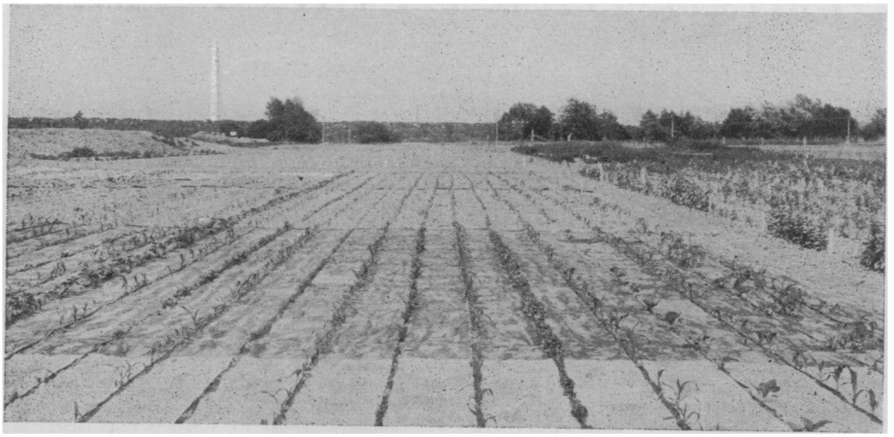
vested, as compared with the control. Further experiments are already under way for this season.

It is as yet too early to prophesy, Dr. Flint states, that all our truck gardeners are going to carpet their ground with paper and thereby double their crops. Economic factors are involved which he has simply disregarded as being not pertinent in these preliminary experiments. Before a gardener can put the paper-carpet system into practice in producing crops for the market, he will have to ask himself whether the cost of the paper and the labor of laying it will be compensated for by the increase in crop and the decrease in the number of hoeings he will need to give it. But it can be tried on a small scale by the home gardener, and at least experimented with by truck raisers of a scientific turn of mind.

The special make of asphalt paper used by the pineapple growers need not be employed in garden-crop experiments in this country. It is rather heavy, being designed to remain on the ground throughout the three or four years' duration of a pineapple planting, and being thus strongly made it is necessarily somewhat expensive. Any of the dark-colored, impervious roofing or building papers to be found on the market will do, so long as they are not impregnated with tar or some other substance harmful to plants. Possibly the heavier, more expensive papers will serve for more than one season. All that is part of the economics of the problem, and will have to be worked out over a period of several years before a definite, positive answer can be given.

The effects of this paper carpeting are three-fold: it attracts and retains warmth in the soil; it prevents evaporation of soil moisture; it effectively keeps down weeds. Each of these effects brings several advantages to the growing crop.

Plants need to have warmth captured and held by the soil for two main reasons. First, their roots grow better and take up water and mineral nutrients more readily in warm than in chilly soil. Second there must also be warmth for the vast, unseen, highly complicated germ life in the soil. that reduces humus and captures nitrogen and performs a dozen other services for the higher plants that are our crops. Each kind of crop plant, and each kind of bacterium and mold and protozoon and



A field at the Government farm at Arlington, Va., laid out in white paper, black paper, and no paper, for comparison. White was not as effective as black, but was better than none

worm that is a part of the germ complex, has its own pet temperature—a degree of warmth at which it "feels best" and can do its work to fullest advantage. But roughly speaking, for most of them this favorite or optimum temperature lies around that of the normal human being. From that up and down about five degrees, though they can still exist and carry on, though to less effect, at what would be far below a deadly chill or above a fatal fever in us. Springtime soil temperatures are below this optimum for crops and their germ friends, and the dark-colored asphalt paper, absorbing the heat of the sun and then holding it down in the soil like a blanket on a bed, raises the soil temperature more quickly and thereby speeds up the growing processes and the work of absorption by the roots.

One important effect which may result from the employment of this method of capturing solar heat and in effect producing hot-house conditions in field soils is the shoving northward of various crop areas now confined to the south by the shortness of the frost-free season north of Dixie. Sugar-cane, for which an immense new market has been opened up by the use of its fiber in building-board, may have its cultivation-area in the United States vastly increased by the use of the "magic carpet," and a whole tier of states may possibly be added to the old traditional cotton belt. Similarly, vegetable growing may be carried farther up the mountain meadows and plateaus of the Rocky Mountain region, where fertile soil and plenty of daylight warmth are at present defeated by the rapidity with which the soil radiates away at night what it gains by day.

The second advantage of the paper mulch system is its preservation of soil moisture. Ordinarily the crevices between soil particles act like a lamp-wick, raising the soil water to the surface, where it evaporates into the air. Thus the soil becomes dry down to the lower root levels, and plants begin to suffer and wilt, or else have to spend an enormous amount of their growth-energy making deeper burrowing roots. In our Southwest the roots of such plants as alfalfa frequently go down as much as ten or twelve feet in their frantic search for water which the dried-out upper soil levels cannot supply.

To break up this wick-like capillary action of the soil, we have to hoe our gardens after every rain. This pulverizes the water-conducting crust and leaves instead a blanket or mulch of fine dust through which water travels very slowly. But a dust mulch presents a dilemma of disadvantage. When a light shower falls, it catches the drops but does not let them go on through to the roots below. When it rains harder the dust becomes mud and has to be hoed again as soon as it dries. And whenever we hoe, we cut the upper roots of the plants more or less, and to that extent injure their growth; not to mention the wear and tear on our perspiring frames and our blistered tempers. Wielding a spade in May is fun, but swinging a hoe in July is a torment to the flesh and a vexation of spirit.

The paper carpet solves the soil water problem by maintaining a permanent mulch through which the springtime supply (*Turn to page* 309)

Earthworks Tell of Early Americans

Anthropology

Chapters from the home life of primitive mound-building Indians are being pieced together by George Langford of Joliet, Ill., as a result of excavations in a group of curious ancient pits surrounding two ancient mounds on the Fisher farm near there. Evidence so far unearthed indicates that the Indians who buried their dead in the mounds built their dwellings in this circle of shallow, saucer-like depressions around them. Details of their daily lives can be read from thousands of things taken out of the pits, such as broken bones of the game they ate, weapons and tools of stone, bone, horn and clamshell, fragments of pottery, pendants and other ornaments, and even from the bones of their dead, found buried rather haphazardly all over the place.

The pits themselves were scraped to a depth of three or four feet beneath the original ground level, and the earth thrown out to make a raised rim two feet or more high; their inside diameter ranges 15 to 30 feet. How the Indians roofed them is not known, for no trace of either covering or of supporting central posts has been found. They were warmed by central fires, for the largest deposits of ashes are always found in the middle of the pits.

A note on mound-builder squaw housekeeping is furnished by numerous holes, about arm-length deep, sunk into the ground both within and outside of the pits. These frequently contain quantities of mussel shells or the remains of hoards of corn; they were evidently the Indian equivalents of cupboards or refrigerators. Other holes served as garbage cans.

That these pits were occupied for many generations is evidenced not only by the large quantity of objects of human use that have accumulated in them, but also by the fact that the tools and weapons are not all of the same workmanship. There are two distinct types of stone implements, and two or more varieties of earthenware pots, hinting at the probable displacement of one tribe by another. The human burials are of three types, indicating a succession of at least three peoples. The last tribe to occupy the pits had contact with white men, for some of the burials have glass beads and other objects of European manufacture associated with them. Two arrowheads of iron, a metal unknown to pre-Columbian Indians, have also been found.

All told, 50 pits have been discovered and measured. Thirty-four of them are arranged in a circle around the two principal mounds that existed at this site, as though their purpose was partly defensive. Fourteen others form another group, and a lone pair stands off at a little distance. Much work remains to be done on these pits, though the exploration of their mounds has been completed.

Mr. Langford, whose researches have been formally reported to anthropological societies, is not a professional scientist, but a factory executive. In his excavations of these Indian earthworks, which have for several years been his principal recreation, he has had the volunteer assistance of two of the members of his factory staff, Albert Tennik and Thomas C. Dudley.

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Magic Carpet—*Continued*

of water can not evaporate at all. Beneath it the ground is mellow and moist to the very surface, just as you will find it beneath a chance board you may have left lying on freshly spaded ground that has elsewhere begun to dry out on top. In this mellow top layer the plants can deploy their roots and help themselves to water and mineral salts as fast as they like.

This cutting down of surface evaporation has another advantage. Evaporating water always reduces temperature, as everyone knows who has ever stepped out of a bathtub even on a reasonably warm morning. Water evaporating from the soil reduces the temperature of the soil, which as has already been noted, needs to be boosted rather than lowered in the spring. By preventing its evaporation the paper carpet is acting in still another way to keep the soil warm.

The function of the paper carpet in keeping down weeds is so obvious that it does not need to be discussed in detail. Weeds, of course, spoil the looks of a garden, but, worse than that, they rob the crop of moisture and soil nutrients, and growing over its head they cut (*Turn to next page*)

Thirty Million Volts From Air

Physics

Millions of volts of electricity drawn from the stormy air may soon provide physicists with the power necessary to disintegrate the atom and transmute one chemical element into another, if experiments made by German scientists continue successfully.

Electricity of nearly two million volts, capable of jumping gaps of nearly 15 feet, has been obtained from the air by Drs. A. Brasch, F. Lange and C. Urban, three members of the staff of the Physical Institute of the University of Berlin.

Mount Generoso, in Switzerland, near Lugano, was the scene of these experiments and the scientists are now preparing to return to continue them. This mountain is noted for the frequency of electrical storms upon it, and also it has the advantage of being easily accessible.

It was found impossible to make use of kites for the purpose of collecting the atmospheric electricity, because a wide meshed wire net having an area of several hundred square yards was needed. It was out of the question, they found, to suspend this from kites or balloons, because such means would be particularly undependable during a storm, when the experiments were made.

In order to get the net as far as possible above the earth, they hung it on a cable between two mountain peaks. The span was about 1800 feet, and the height of the net above the ground about 250 feet. At each end were chains of insulators capable of withstanding as much as 3,000,000 volts.

Another problem was to prevent what are called brush discharges, in the conductors which carried the current from the net to the measuring instruments. The intensity of these discharges is less, the greater the radius of curvature of the conductor, so that the discharges would be less from a large hollow cylinder than from a smaller solid wire, with the same amount of metal. As long cylindrical conductors would have been diffiuclt to transport to the mountain, Dr. Brasch and his associates made use of a string of short, round-ended cylinders.

From a lightning proof metal house the observations and measurements were made. (*Turn to next page*)

Isostasy

Geology

To be sung to the tune of "Maryland, My Maryland.

What is it rules the upper crust?
Isostasy, Isostasy.
What actuates the overthrust?
Isostasy, Isostasy.
What gives the shore lines wanderlust?
What humbles highlands to the dust?
What makes the strongest stratum bust?
Isostasy, Isostasy.

That all's in equilibrium,
So Bowie says, so Bowie says,
Is proven by the pendulum,
So Bowie says, so Bowie says.
And why the plumb line's never plumb
And why the mountains go and come
Is simple as the rule of thumb,
So Bowie says, so Bowie says.

Conservatives in vain have cussed
Isostasy, Isostasy;
The strongest power on earth is just
Isostasy, Isostasy:
So let us down our deep disgust,
If we'd seem up to date we must
Roll up our eyes and take on trust
Isostasy, Isostasy.

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Thirty Million Volts—*Continued*

The spark gap, under the last of the short cylinders, could be regulated from this post, and, from the length of the gap across which the spark would jump the voltage was determined.

As the chief electrical storms of the neighborhood are in the summer, and as the apparatus was not completed until last August, the best storms had to go unused. One storm occurred after it was completed, and indicated the success of the method. The spark gap could not be made larger than about 15 feet, but the spark easily jumped across it at the rate of about one per second and continued for thirty minutes at a time. Also, it was found with an auxiliary collecting antenna, and with distant storms that affected the main station, that a discharge of once a second was possible at all times.

During the winter months, the experiments were discontinued, but the apparatus was left in place. The scientists are now preparing to return, to take full advantage of the storms this season. With the antenna about three hundred feet above the earth, a height that could easily be obtained, voltages as high as thirty million would result.

Dr. Brasch and his colleagues credit Benjamin Franklin with being the pioneer experimenter in the field in which they are working. One possible use of these huge voltages, they say, is to generate extremely rapid cathode rays, similar to those formed in the tube recently developed by Dr. W. D. Coolidge, of the General Electric Company. These are similar to one of the principal radiations from radium, but with 30 million volts, the artificial rays would travel even faster than those emanating from radium itself.

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Primitive men, it is believed, ate only once a day.

Grasshoppers are an important item of food in India.

The price of giraffes has more than doubled since the war.

The natural gaits of the horse are the walk, canter and trot.

Magic Carpet—*Continued*

off the all-necessary sunlight. Weeds are the second great compulsion for the hoe; but as we chop them down we face the discomforting reflection that, try as we may to spare the vegetables, we are cutting their roots, too. Even in their death the weeds do us a mischief.

But under the impervious blanket of asphalt paper they never get a chance to be born. Their seeds may germinate, and their feeble infant sprouts crawl about, vainly seeking the sunlight without which they can not live. But, when their initial stock of nourishment has become exhausted, they perish, and the waiting germ life of the soil seizes upon them and returns them to the mold from whence they came, and the roots of our garden vegetables pluck up their substance and turn it into food for our tables.

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Light colored walls make a room look larger than dark walls.

An airplane recently collided with a mountain peak in Europe, killing two fliers.