of this issue will see at once a number of possible dispositions of the evidence here announced, but such matters can not be dealt with in this brief note. It should be noted, however, that this discovery puts on record the first area, to the writer's knowledge, in which the relation of the orogenic movements to the dinosaur-bearing strata is unmistakably clear and not subject to the debatable elements of interpretation. Whether the end of the Cretaceous is to be set at the major orogenic disturbance or at the disappearance of the dinosaurs need not be considered here. The relative significance in terms of the physical record of the names Cretaceous and Tertiary is of lesser importance just now than the recognition that the dinosaurs were present some time after the early and more profound folding in this part of the Cordillera and that the beds containing the dinosaurian remains can hardly, by any stretch of imagination, be considered later than the Lance beds of the plains. Final analysis will probably justify the classification of the strata as Cretaceous.

The regional implications of this discovery can not yet be stated with any certainty, but the profundity of the folding and thrusting in the Wasatch Mountains, considered along with the known structural relations to the north, in Idaho, Wyoming and Montana, almost excludes the possibility that the disturbance was merely local, and suggests strongly that we are dealing here with the major orogenic movement in this general belt of the Cordillera.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

PETROLEUM SPRAYS FOR DANDELIONS

THE very general interest shown in a paper read by the authors at the Pittsburgh meetings leads us to publish this preliminary note on our experiments in the control of dandelions with petroleum sprays. Certain of the higher boiling hydrocarbons contained in the groups sold commercially as distillates and kerosene show a remarkably differential action when sprayed on bluegrass (*Poa pratensis*) lawns at the rate of 200 or 300 gallons an acre. Under favorable conditions the dandelions (*Taraxacum officinale*) are slowly but completely killed, while the bluegrass sod is only temporarily affected. In our experiments, sprays applied on September 20, 1933, in rather warm weather, resulted in a 70 per cent. control of dandelions. Sprays applied on June 6, 1934, in the evening of a hot day, resulted in 63 per cent. control. Sprays applied on a hot day in July of the same year were not carefully checked but gave no noticeable control. Sprays applied on October 1, 1934, in frosty weather resulted in controls of 99 to 100 per cent. Sprays applied on May 20, 1935, in distinctly cool weather (60° F.), have given a control of 95 per cent. or better. It is not clear at the present time whether the stage of development of the dandelion plant at the time of applying the spray is the important factor or whether temperature with its effect upon vaporization of the applied material is the more important. We are inclined to think that temperature is at least a major factor, and would recommend spraying only in cool weather. Petroleum sprays will readily adhere to and penetrate the foliage, either wet or dry, of both dandelions and lawn plants so that a period of cool rainy weather in the spring or fall would appear to be a favorable time for applications. Our results to date would favor fall applications, largely because fewer dandelion seedlings develop before the stolons of the bluegrass have spread to fill in the open areas.

The material may be sprayed broadcast over the lawn at the rate of one half gallon per 100 square feet or, where the dandelion plants are more scattered, a spotting method of spraying may be used. Applications in excess of 300 gallons an acre or about three quarts per 100 square feet may injure the grass, and the use of impure distillates showing a yellow coloration has resulted in a complete kill of bluegrass and white clover sod so that only the water-white products should be used, and even among these some appear to be more toxic to bluegrass and less differential in their action than others. This toxicity is reduced by washing the distillates with H_2SO_4 to remove unsaturated hydrocarbons.

The distillate sprays penetrate the leaves of the dandelion and other plants almost instantly and appear to be slowly moved downward through the roots. Injurious effects other than a cessation of growth may not appear for a week or 10 days, and frequently dandelion plants will continue to die for a month after the spray is applied. Under favorable conditions the entire root system of the plant is killed, and apparently the top dies as a result of this injury to the root. Under less favorable conditions only the upper portions of the root may be killed, and the plants may be reestablished by sprout development. The growth of seedlings, however, is under average conditions more serious than sprouting from the roots in the reestablishment of the dandelion plants. Plots sprayed on June 6, 1934, with straw-colored distillate sprays which killed both sod and dandelions, and reseeded with grass, gave an almost solid stand of dandelion seedlings which developed more rapidly than the seedling bluegrass. Adjoining plots which were sprayed

with water-white kerosene showed a 60 to 70 per cent. control of the old dandelion plants, and as far as could be observed no seedlings were able to maintain themselves in the only temporarily injured bluegrass sod. The ability of established sod to prevent the invasion of dandelion seedlings has been demonstrated by plots sprayed in May of 1933. Although completely surrounded by a very heavy stand of seeding dandelion plants, these plots at the present time show a dandelion infestation less than 2 per cent. of that present on the adjoining control plots. Fertilization, including the use of ammonium sulfate at the rate of one half pound per 100 square feet once or twice a year, is an important factor in maintaining a sod sufficiently close and heavy to prevent the invasion of dandelion seedlings.

We are continuing our work on the effect of biologic and weather factors and a more careful determination of the active constituents of the sprays. At present we are inclined to the view that saturated hydrocarbons of the medium boiling point series are the effective ingredients. More complete data will be published at a later date.

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AN APPARATUS FOR AUTOMATICALLY MAINTAINING REDUCED PRESSURE

A DESCRIPTION is given here of a simple device for maintaining reduced pressure automatically. The apparatus consists mostly of ordinary laboratory glassware, and can be built at very little expense.

A filter pump P (see sketch) is connected to a spring faucet F of the type which supplies water when the handle is depressed. The air tube of the filter pump is connected by means of glass tubing to a valve V, made of a 250 cc filter flask with a glass tube inserted through a rubber stopper and dipping into mercury in the bottom of the flask. The valve is connected, as is shown in the sketch, to a five-gallon bottle C_1, which is connected by means of glass, and rubber, tubing to a similar bottle C_2, several feet below. In each case glass tubing extends nearly to the bottom of the bottle.

Bottle C_2 is suspended from one end of a steel bar A, which is about 65 centimeters long, and which is in turn supported by a bolt through a hole about 16 centimeters from the point from which the bottle is suspended. A piece of steel wire is attached between a point on the bar above the center of the bottle and the end of the faucet handle. Near the other end of the bar are hung a three kilogram weight and a mercury leveling bulb B_1. A second mercury bulb B_2 is placed

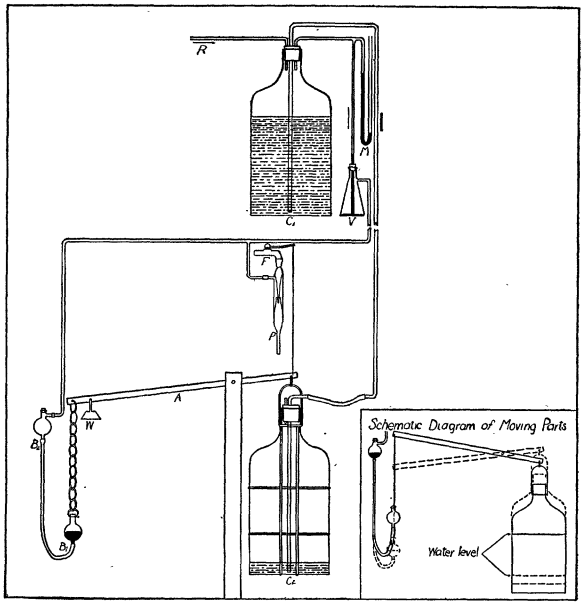

FIG. 1. Reduced pressure apparatus: A, arm, supported by bolt; B_1 and B_2, leveling bulbs; C_1 and C_2, five-gallon water bottles; F, water faucet; M, manometer; P, filter pump; R, laboratory reduced pressure line; V, air valve; W, weight.

in a stationary position and is connected so that mercury is free to flow from one bulb to the other, depending on differences in pressure. The air space of the bulb is connected to the air line leading to the pump by means of glass, and rubber, tubing.

A manometer, M, indicates the pressure in the reduced pressure line. Maximum variations of pressure were found to amount to seven cm of mercury while the apparatus was in use.

The functions of the various parts of the system may be seen by an examination of the sketch. The mercury and water assume the levels shown, when no air is being admitted, and after the system has come to rest. When the flow of water through the filter pump decreases to such an extent that the pump no longer draws air from C_1 the weight of the mercury, which then flows from B_2 to B_1, depresses the longer arm of bar A and allows the spring faucet to close completely.

The effective height of the water column between the two bottles is a function of the difference between the pressure in the reduced pressure line and atmospheric pressure. The difference between the elevations of the two bottles must be such as to give the desired reduction in pressure.

The original apparatus has been in constant service for two years without necessitating repairs or changes in adjustment.

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