

and repairing is done? Discuss cost of providing this convenience and approximate saving per year. What advice have you to offer to newcomers along the line of having a workshop on the farm?

December 21.—How do you manage, feed and care for the boar in winter and summer? If kept for public service, what suggestions have you to offer as to his use, fee to charge, etc.?

Improvement of Farm Crops

At this the close of the threshing season, when bushels show successes and failures, a brief outline of the various steps in the improvement of farm crops is of special interest. The gradual development of the systems for preparing grain for the special purposes of seed has been evolved from a very primitive method to a highly scientific operation. Originally in the earlier crude systems of cultivation it was not even considered necessary to prepare the seed in any special way, beyond the mere process of threshing with the flail and separating out the chaff from the grain, this being essential to allow the grain to be broadcasted on the ground sufficiently even to give a regular seeding.

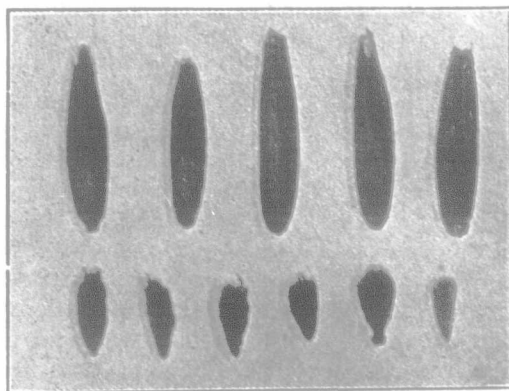
As improvements in the systems of cultivation and tilling the land developed, the importance of giving attention to the more thorough cleaning from detrimental weed seeds and light, immature grains of the seeds required for seeding purposes was naturally observed in conjunction with the improved methods of preparing the soil and seed-bed, and was well repaid in the extra return at harvest, as compared with the haphazard methods previously adopted. From this simple system of seed preparation have gradually developed, through various phases, the many improvements in the systems adopted for producing seed capable of giving a vigorous growth with a subsequent high productive value.

When the improvement of seed by mechanical dressing had reached its height it was followed by the further advanced system of selecting the finest heads of plants in the ripening crop, and using these as special stocks to grow for use for seeding purposes only. This advanced system of improving the grain crops of the country was followed by decidedly beneficial results as the seed so treated was more or less mixed with other varieties, and this method of treatment did much to remove these; to purify the variety and make the resultant crop even in ripening, in height of straw, in quality of grain, etc. Indeed, the selection of the best heads and plants, and the sowing of the produce of these for further selection is being carried on by many farmers to-day, and is undoubtedly a splendid thing for the farmer whose grain is mixed with a number of different varieties, as it enables them to purify the variety. Apart from this, however, no satisfactory improvement will be noted

when stocks from apparently superior plants are sown side by side and under identical conditions with average plants taken from the same plot. Extensive experiments conducted for years by the well known farm plant breeder, John Garton, proved conclusively that the apparent superiority of the selected plants was due either to varying fertility of the soil, space occupied by the individual plant, difference in the time of germination (owing to the seed's position in the ground and its nearness to moisture, etc.), or in some cases the destruction of the embryo stools by insects rendering the plant a light stooler, and, consequently, making it stronger, earlier and a heavier yielder of large, plump grain.

CONFIRMED BY CANADIAN AUTHORITIES

These conclusions have been recently confirmed by one of Canada's highest authorities on plant breeding, Dr. C. E. Saunders, cerealist of the Dominion Experimental Farm, who, in an address before the select standing committee on agriculture and colonization, said: "This is the age of selection, as you know, and the question often arises: Why not select Red Fife for earliness, instead of trying to produce by cross breeding a new wheat which shall be earlier than the Red Fife and equal to it in other re-



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No. 3 (enlarged)—Blind or sterile grains produced by weak and degenerate seed, due to failure to fertilize at the period of blooming, owing to the weakened condition of the plants and their inability to stand adverse weather conditions. Some of these have been seen this season in the crops grown from the choicest seed on account of the extremely hot weather in certain districts when the florets were being fertilized.

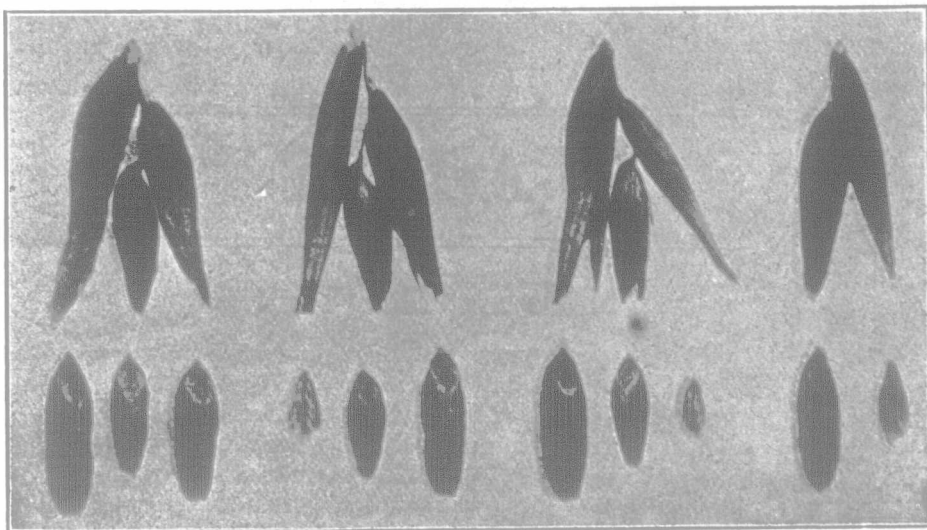
where the repeated selection of fine heads lead to disastrous results. An important and well managed agricultural station (the name of which need not be mentioned) sent out a superior strain of Red Fife wheat, in which I was unable to find any Red Fife at all. The superior looking heads had been selected, and these were White Russian. This shows how difficult that system is. When such a thing can occur with very careful workers in a good institution, it would certainly often occur with ordinary farmers." If an experiment station, where the work of selection is supposed to be carried on by experts makes a mistake of this kind, it is only reasonable to suppose that the farmer, who seldom has the time or the training for the work of selection (which comes at the busiest season of the year), will secure little or no improvement. Selection being of doubtful value as a means of plant improvement, the question naturally arises as to how bigger yields and better quality of farm plants are to be secured. And the answer is: By breeding.

In 1880 John Garton discovered that all grains and grasses were perpetually self-fertilized, and established on a scientific basis a method of cross-breeding,

whereby new and improved types could be produced at the will of the operator and endowed with special characters necessary to fit them for the various requirements of cultivation under the numerous conditions of soil and climate. From that time rapid strides were made and innumerable types evolved, possessing characters of vigor and constitution not to be found in the older types, even when these had been brought up to the highest standard of purity by the original system of selection practiced. It is known that a large proportion of the oat crop of this country is annually raised from the new stocks produced by this scientific system of breeding. These recent developments and investigations in scientific cereal breeding have disclosed much useful information regarding the structure and functions of the reproductive portions of the plant responsible for seed production, and revealed in a very practical way some of the obscure reasons responsible for the deterioration of vigor and decrease in the productive capacity of cereal crops, enabling the investigator to put into operation counteracting systems of artificial breeding by which the subsequent progeny is invigorated and the deteriorating influences brought about by self-fertilization or close inter-breeding entirely remedied.

STAMINA AND VIGOR ADDED

Based upon the fact that observations over half a century had proved that pedigreed animals deteriorate in stamina unless reinvigorated by the introduction of stock animals of distinct parentage, investigations proved that the same law governed the stamina and vigor of the highly cultivated plants of the farm, and rendered equally necessary their periodical rein-



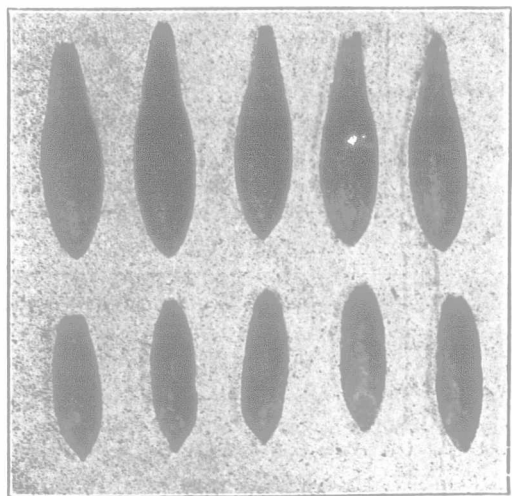
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No. 1 (enlarged).—Shows four panicles at different stages of productiveness, together with the kernels produced by each. The first represents a panicle from a vigorous regenerated stock. The kernels produced are shown separately at the base, and are all fully developed kernels. The second, third and fourth are panicles from weak and degenerate seed. In the second panicle the leading or largest floret has failed to fertilize and produce a kernel. In the third panicle the second-sized floret has failed to fertilize, and in the fourth, in addition to the failure of the second-sized floret, the third floret of this panicle has entirely failed to develop. This illustration demonstrates how yields are reduced when crops are grown from weak and degenerate seed.

spects? If we pick out the earliest heads of Red Fife every year, and gain only a day in earliness every year for, say, twenty-one years, we shall then have gained three weeks. I think it is Darwin's influence which makes almost everyone believe that this method of work is very promising, and we are asked sometimes why we do not try it. To that question there are two answers. The first is that we have tried it, and are still trying it; and the second is that no such results as one might expect can possibly be reached. You cannot select out of Red Fife early heads every year, and secure by this continuous selection any such continuous improvement as that which I have referred to. It is possible if one could carry out the process for about twenty-one thousand years that he might succeed in gaining twenty-one days in earliness, but it cannot be done in twenty-one years, or any such period. In fact, the process is so slow that the progress is, I should almost say, not to be seen at all; provided that one begins with an absolutely fixed variety of wheat. Of course, when selection is commenced with mixed seed the progress is very rapid at first, but this is really purification which is going on rather than improvement in the strict sense of the term."

THE FARM PLANT BREEDER'S WORK

There are so many points entering into plant improvement, such great care must be exercised and such varied accurate scientific information is necessary to the progress of the work that it may well be left for the plant breeder, the man who makes a business of it, who has it for his hobby. That Dr. Saunders is of this opinion is evidenced by another statement from the source mentioned above. He says, in part: "I have seen cases



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No. 2 (enlarged).—Matured grains and kernels produced by a vigorous regenerated seed.