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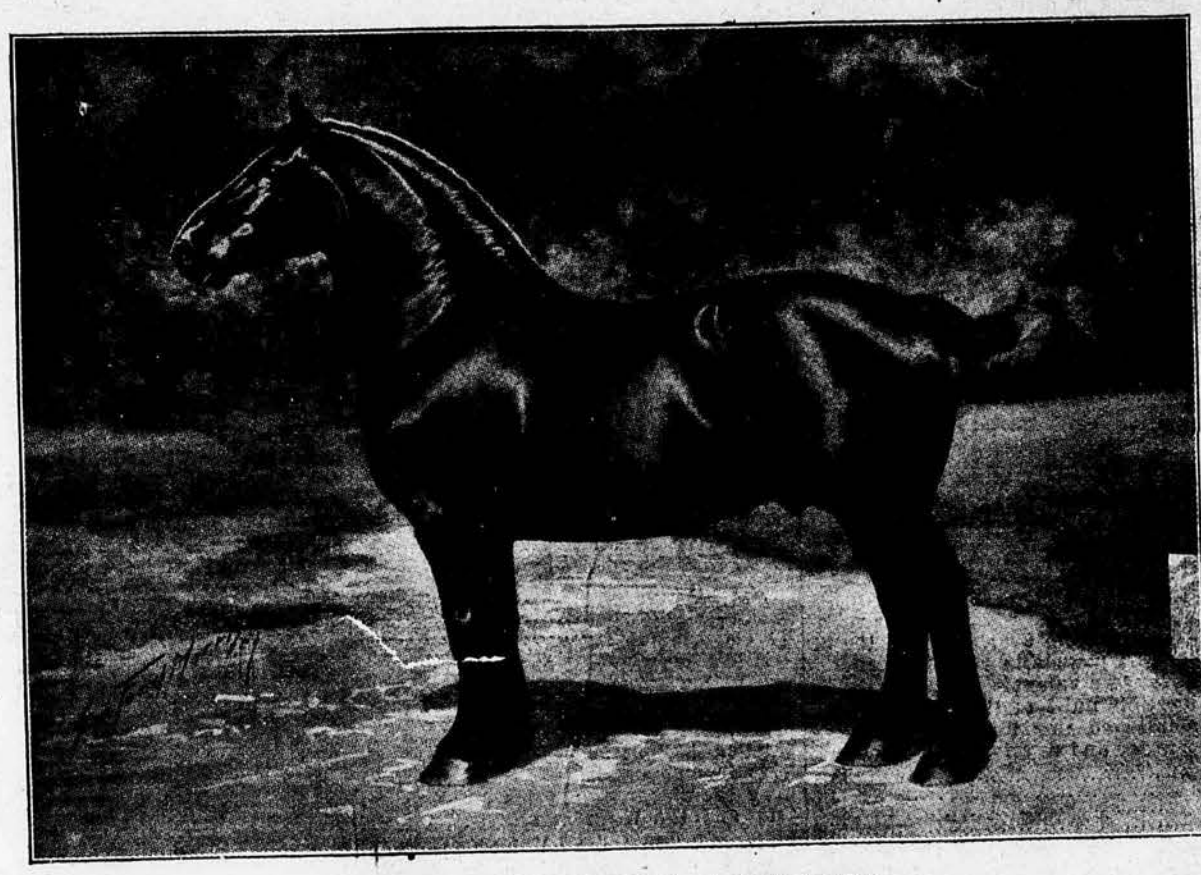

DUBLIN 24680 (44533).

Recently installed as herd horse by Henry Avery & Son, of Wakefield, Kans. This enterprising firm brought the first pure-bred Percheron horse to Kansas, and has kept a remarkable line of herd sires from the beginning. The price of herd sires alone aggregating over $16,000. This new herd stallion was imported in 1900, is 3 years old, weighs 1,900 pounds, sired by Theudis 25015 (44433), champion breeding stallion at Chicago International, and is a half brother to Pour quoi Pas, who won the championship. He is a splendid example of the heavy-boned, well-finished Percheron horse. He was on exhibition the entire week at the horse judging at the State Agricultural College, where he won first prize as a draft horse and also first as an idal farm horse.

John Bull is a large importer of beef. Your Uncle Samuel furnishes about three-fourths of the imports of this essential to the Englishman's comfort and well-being.

In his article in the KANSAS FARMER of March 20, Mr. C. Wood Davis was made to say, "March" instead of "February," in the eleventh line from the bottom of the second column on page 233.

A correspondent states that last year he put some ashes in his garden and it seemed to burn up the ground and seed. Wood-ashes used sparingly are excellent for the garden, but if used in excess they have the effect noted. Will some subscriber, who has had experience, tell about how much ashes to apply to each square rod?

A good deal has been written and printed about what Secretary Coburn is supposed to think of the prospects for a wheat crop in 1902 in Kansas. The KANSAS FARMER has not consulted with Mr. Coburn as to his views or whether he has said anything in relation to the prospects. The Kansas secretary is not in the habit of giving out guesses, but bases his statements on reports from farmers in every part of the State. Thus far no such statement has appeared. It is not surprising that market-manipulators try to bring to the support of their statements the conservative name of Coburn. It is safe for persons whose interests are affected by these manipulations to wait for Mr. Coburn's official statements before crediting rumors as to his views. If Mr. Coburn should attempt to deny all reports as to his supposed opinions he would have little time to devote to the important work for which Kansas pays him.

POST-CHECK CURRENCY.

The post-check currency bill, now before Congress, provides for printing the $1, $2, and $5 bills in the future with blank spaces on the face. These bills pass from hand to hand before the blanks are filled. When it is desired to send one in the mails the blanks are filled in with the name of the payee, his city and State, a 2-cent postage stamp is placed in another blank space and canceled with the initials of the sender in ink, the name of the sender is signed on the back, and his money has suddenly ceased to exist as currency and has been transformed into a check on the United States government, having all the safety of any bank check, and ready for inclosure in his letter. When the payee receives this check he treats it just as he would have any other check—indorses it, goes to the nearest bank of post office and deposits it or has it cashed.

The paid check finally reaches the Treasury Department, when it is replaced by a new one with the spaces unfilled. This keeps the circulation at par. No change whatever is made in the financial policy of the governement, the only change being in the character of the printing on the bills of $5 and under.

The bill also provides for the issue of $75,000,000 of fractional currency, with blank spaces similar to the larger de-

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nominations, in place of an equal amount of money of larger denominations, presumably $20 and $50 bills. The provision under the new system for a continual reissue insures clean money both in the fractional currency and in the larger bills. The government fee on the 5-, 10-, 15-, 25-, and 50-cent pieces is to be 1 cent each.

FIGURING ON FEEDS.

EDITOR KANSAS FARMER:—Please inform me, through the FARMER or otherwise, which of the following will make the best and cheapest feed for hogs and shoats averaging about 125 pounds. If a combination will make a better fattening ration, give the proportions. Corn at $25 per ton, bran at $19, shorts at $20, and wheat at $22. The shorts have considerable bran in them and I do not think they have the feeding value of a good grade.

Please give through the FARMER the method and results of feeding dried blood and bone-meal to hogs, and state where it can be procured, and price per hundredweight. C. E. CHENEY.

Manchester, Dickinson County.

Our correspondent raises questions whose satisfactory answers would require discussion sufficient to fill a book. In the space of a newspaper article we can hope only to make a few helpful suggestions.

The average digestible nutrients of the four feeds mentioned as accepted by standard writers, are:

DIGESTIBLE NUTRIENTS IN 100 POUNDS.

	Protein. Lbs.	Carbohydrates. Lbs.	Fats. Lbs.	Totals. Lbs.
Corn	7.8	66.7	4.8	78.8
Wheat	10.2	69.2	1.7	81.1
Bran	12.8	37.1	2.6	52.0
Shorts	12.2	50 0	3.8	66.0

The fact has for some time been recognized by scientists, and is coming to be realized by all feeders, that even hogs must have muscle-building as well as fat-forming food. Our correspondent's first paragraph suggests a discussion of the relative values of the feeds mentioned for the general purpose of promoting the growth and finish of his hogs. In his second paragraph he suggests a "fattening ration. Not unlikely the two paragraphs suggest different problems.

In the last column of the table above, it is apparent that the quantity of digestible material in the several feeds mentioned, varies from 52 pounds in 100 of bran, to 81.1 pounds in 100 of wheat.

If feeds were valuable in proportion to the digestible nutrients they contain, the four mentioned would stand in the following order and relative values:

1. Wheat	81.1
2. Corn	78.8
3. Shorts	66.0
4. Bran	52.0

If, under the supposition that values are proportional to digestible nutrients, we assume that corn is standard feed and worth $25 per ton, we shall find the following values per ton for the several feeds:

1. Wheat	$25.79
2. Corn	25.00
3. Shorts	20.99
4. Bran	16.54

But it is probably not true that feeding values are proportioned to the weight of digestible nutrients in a ton of each of the feeds. The growth and development of the animal require that certain nutrients be supplied, at whatever cost. If these nutrients can be provided for little money, well and good, but if they cost more they must still be had. The nutrients designated by the term protein are of this essential kind. They do not usually contribute to the fat of the animal body, but they are necessary to the production of muscles, the vital organs, and, indeed, to the formation of all tissues except fat. They are also found in most of the fluids of the body, including the digestive juices.

Under ordinary crop-conditions the production of protein is less abundant in proportion to the need for it than is the production of carbohydrates and fats. On this account we usually pay higher prices for feeds rich in protein than for those composed more largely of carbohydrates and fats. About two years ago, when relative prices of the several feeds were believed to be about normal, the writer made computations to determine the relative values of the nutritive ingredients of feeds. It was found that at prices then prevailing for staple feeds, the following were the corresponding values of the three principle digestible nutrients:

Protein per 100 pounds	$3.37
Carbohydrates per 100 pounds	.32
Fats per 100 pounds	*.56

Applying these values to the data furnished by chemists as to composition of the feeds under discussion, we shall have the following as the values of the feeds, as prices were two years ago:

Corn per ton	$10.00
Wheat per ton	11.50
Shorts per ton	11.84
Bran per ton	10.96

But the price of corn as given by our correspondent is two and one-half times that of two years ago. Multiplying the several values of two years ago by 2½ we shall have as present values, based on corn at $25:

Corn per ton	$25.00
Wheat per ton	28.75
Shorts per ton	29.10
Bran per ton	27.40

It is a notable fact of last year's crop-production that the feeds rich in protein were less disastrously affected by the dry weather than were those containing smaller proportions of this ingredient. This fact should have a tendency to reduce the disparity of price between protein and the more carbonaceous nutrients. No doubt market prices have, to some extent, reflected this partial equalization of supplies, but the erratic prices which have prevailed have baffled attempts to arrive at an accurate estimation of values under this year's conditions. Ordinarily the relation of supplies of protein and nutrients other than protein to the demand for each of these classes of nutrients is such that protein is worth per 100 pounds about ten times as much as carbohydrates and, say five times as much as fats. If we conceive that some future season shall give us excessive supplies of protein and greatly deficient supplies of the other nutrients it will be seen that protein may become the lowest priced ingredient in the market. The question of present relative values of protein, carbohydrates, and fats is a matter of considerable uncertainty. This uncertainty carries with it like uncertainty as to the relative values of the feeds under discussion.

Our correspondent remarks that the shorts are below grade. This introduces another element of uncertainty of which it is impossible to take account without more definite information. The foregoing discussion, as well as that which follows, is based on average compositions of the several feeds.

But our correspondent wants to provide the best feed at the money for his 125-pound hogs. This involves a consideration of balanced rations. Much attention has been given both in Europe and in this country to determining in what proportions animals should be provided with the several digestible nutrients in feeds. It can not be said that the "feeding standards" which have been published are entirely satisfactory. The quantities prescribed present variations which are inconsistent. These variations may be interpreted as so many guarantees that the results obtained from the experiments are faithfully reported, but they also emphasize the importance of further repetition of the tests.

In the tables of "Feeding Standards" for swine the fattening period is divided into three periods. The sizes covered by each period are not designated, so that in the use of these tables we are left somewhat to conjecture. If we assume that our correspondent's hogs come in the "second period" the "standard" ration for each 1,000 pounds, or for each eight hogs, will be:

	Protein. Lbs.	Carbohydrates. Lbs.	Fats Lbs.
Standard daily ration	4.0	24.0	0.5

Referring to the table of "Digestible nutrients in 100 pounds," given above, let us first consider corn. If this grain were a little richer in protein, 100 pounds would furnish enough of this nutrient for .2,000 pounds, or sixteen of our correspondent's hogs. But 100 pounds of corn will furnish 66.7 pounds of carbohydrates, whereas the sixteen hogs require only forty-eight pounds of this nutrient. The 100 pounds of corn will furnish 4.3 pounds of fats, whereas the sixteen hogs require only one pound. Tabulating these facts we have:

	Protein. Lbs.	Carbohydrates. Lbs.	Fats. Lbs.
Sixteen hogs, 125 pounds each, require	8.0	48.0	1.0
Corn, 100 pounds	7.8	66.7	4.3

Evidently corn alone is not a "balanced ration" for hogs. To get enough protein the hogs will have to eat far too much carbohydrates and fats. This is worse than waste.

If we likewise compare wheat with the standard we shall find that 100 pounds of wheat will furnish a little more than enough protein for a day's ration for twenty of these hogs. Let us place the results as to wheat in comparison with the requirements for the twenty hogs:

	Protein. Lbs.	Carbohydrates. Lbs.	Fats. Lbs.
Twenty hogs, 125 pounds each, require	10.0	60.0	1.25
Wheat, 100 pounds	10.2	69.2	1.7

Evidently wheat is a more nearly balanced ration for hogs than is corn.

Bran will furnish, per 100 pounds, a little more than enough protein for 24 of these hogs. The comparison as to bran will then be:

	Protein. Lbs.	Carbohydrates. Lbs.	Fats. Lbs.
Twenty-four hogs, 125 pounds each, require	12.0	72.0	1.5
Bran, 100 pounds	12.8	37.1	2.6

Bran is greatly deficient in digestible carbohydrates and contains a surplus of fats.

Shorts will likewise furnish, per 100 pounds, a little more than enough protein for 24 hogs. The comparison as to shorts is:

	Protein. Lbs.	Carbohydrates. Lbs.	Fats. Lbs.
Twenty-four hogs, 125 pounds each, require	12.0	72.0	1.5
Shorts, 100 pounds	12.2	50.0	3.8

The shorts contain more carbohydrates than does the bran, but not enough to balance the other ingredients.

It will be readily seen that for best results our correspondent should combine some of his feeds. For light on this branch of the subject the reader is referred to the discussion by Prof. J. T. Willard on page 355, on "The Exact Calculation of Balanced Rations." Professor Willard's method involves the use of no mathematics higher than arithmetic. The writer has a somewhat simpler method by the use of algebra. This will be given in the KANSAS FARMER at an early date.

Dried blood and bone-meal can be obtained from the packing-houses. Their use for hogs has not been extensively experimented with. The KANSAS FARMER will have more to say on this branch of the subject at another time.

*The relative values usually assigned to carbohydrates and fats are as 1 to 2¼. For reasons the statement of which would consume too much space here the writer used the relative of 1 to 1¾.

Pneumonia in Cattle.

PRESS BULLETIN KANSAS EXPERIMENT STATION.

At various times in the past there has appeared in the West, especially during the winter season, a form of bronchial pneumonia attacking cattle sometimes in such numbers as to appear to be contagious. These outbreaks have usually occurred during the winter which succeeds an unusually dry season, when the water supply for stock purposes is greatly reduced and the rough forage used for feeding cattle is of poor quality. During the past fall and winter numerous reports of a disease among cows and heifers have been received from various and widely separated places in the central and eastern parts of this State. In most cases several animals were reported sick with the same general symptoms, which caused the owner or neighbors some alarm lest it might be a serious, contagious disease. Owing to the similarity of symptoms, some stockmen have surmised that their cattle were suffering from bovine tuberculosis in an acute form. An investigation of the disease shows it to be a broncho-pneumonia or an inflammation of the bronchial tubes, which cary the air into the lungs, together with the adjoining lung tissue. The disease is of a comparatively mild type, and so far as has been observed, has only attacked cows and heifers. Most of the animals examined have been in fair to good flesh.

The disease is probably caused by a poor quality of coarse food, especially corn-fodder. The dust or other irritating material in the fodder seems to irritate the bronchial tubes; this irritation enables certain bacteria that live in the air passages normally, to multiply rapidly and cause an inflammation of the tissues. The disease is not contagious but several animals may contract it from the same source; that is, infected food.

The animal is noticed coughing, especially when first turned out or exercised after lying down. The cough is painful; at first, dry, and as the disease progresses becoming more moist, the animal often coughing up considerable mucus. The breathing is rapid and labored; exercise causes the animal to pant, cough, and often stand with the mouth open and the tongue protruding, in order to breathe. There is a tendency for affected animals to lie down, and in severe cases the nose is extended in front, the lower jaw resting on the ground. In mild cases the appetite may be fairly good, but in severe cases the animal eats but little and this, with the distressing cough, causes a rapid falling away in flesh. The bowels are usually constipated. A majority of affected animals will recover, with good care.

The lungs, when examined after death, do not appear severely inflamed. They are of a grayish color and instead of being soft and elastic to the touch are quite firm and hard, and do not collapse, as is usual when the chest is opened. The smaller bronchial tubes are filled with mucus; the large bronchi and the trachea (windpipe) are slightly inflamed and contain much mucus.

Medicinal treatment is of little value; in fact, the excitement attending drenching the animal and the possibility of getting medicine into the lungs is apt to do more harm than good. The animal should receive the best of care; protection from the weather; laxative, nutritious, but not bulky food; and pure water. Corn-stalks should not be fed; alfalfa, millet or other hay should be sprinkled to lay the dust. Salting the animal, with a mixture of 1 pound of sulphur, 1 pound of air-slaked lime, 1 pound of hyposulphite of soda, all thoroughly pulverized and mixed with 10 pounds of common salt is good; a tablespoonful may be given once daily, the animal being allowed to lick it. Bran mashes, to which is added some cotton-seed or oil-meal, are excellent. With the advent of warm weather and grass the disease will probably disappear.

Life is neither a pain nor a pleasure, but serious business, which it is our duty to carry through and conclude with honor.—Tocqueville.

Agricultural Matters.

Alfalfa on Upland in Rooks County.

EDITOR KANSAS FARMER:—Has any of the subscribers ever had any experience with alfalfa on upland this far west? If so, a good many of us here would like to hear from some of them through the KANSAS FARMER. E. H. HULSE.

Stockton, Rooks County.

What Grass for Woodland Pasture?

EDITOR KANSAS FARMER:—I would like a little advice, and if it is published in the FARMER it may assist others to make a choice when in doubt.

I have a piece of woodland, most of which is open timber and all of it small timber, second growth. With a little care I think it could be made good pasture. There is nothing but a sprinkling of wild grass there now. The soil is like the majority of hill-land in this county—some of it thin and some good loam soil. What kind of seed or mixture of seed should I plant for the best results? I have tried blue-grass seed until I am discouraged (not on this ground, but on land similar and close to it). I can not make it grow. If you consider blue-grass the best, what is second best? R. A. STEARNS.

Edwardville, Wyandotte County.

Try orchard grass and report results. If any farmer can offer experience on the subject of this inquiry he should print it in the KANSAS FARMER.

Pencilaria and Teosinte.

EDITOR KANSAS FARMER:—Can you tell me anything about the new forage plants, the catalogues praise so much; namely, pencilaria and teosinte? Do you know how they will do in western Kansas? I will try teosinte in a small way this year, but I would like to know if any of your readers have tried them.

Dean, Haskell County. S. DERBY.

From reports which were printed in the KANSAS FARMER at about the time when Mr. Derby was writing his letter and doubtless reached him a few days later, it appears that pencilaria is a valuable forage crop and a good drouth resister. The editor saw some teosinte a few years ago. It was growing at Ellinwood, Barton County. It is a rank grower and produces immense quantities of leaves. It does not produce seed as far north as Kansas. It should do well under irrigation and might make a good deal of feed with a limited amount of moisture. It has the appearance of a tropical plant that would relish rich soil and plenty of moisture. The KANSAS FARMER will be glad to hear from any reader who has tried teosinte.

The Seed-corn Question.

EDITOR KANSAS FARMER:—I would like to have some information in regard to the productiveness of the 1901 seed-corn grown in the dry section.

First—Will corn grown in these dry sections, if planted, produce ears, if a favorable season follows? Second—Will seed-corn coming from a distance of 200 or 300 miles produce equal to the corn that has been acclimated?

What has the experiment station done along these lines? A SUBSCRIBER.

Gardner, Kans.

First—There is no apparent reason for doubting that corn grown during a dry season will, if used for seed, produce ears.

Second—Some farmers have a theory that seed-corn which comes from a distance is preferable to that grown at home. The writer has seen no statement of an adequate reason for such belief as a general proposition. There are cases in which a plant gradually changes its characteristics under local conditions. These changes may be in undesirable directions. Thus, if it were true that under the conditions of a locality the production of barren stalks were increased, this tendency might be counteracted by the importation of fresh seed from some locality where conditions tend to decrease the percentage of barren stalks. So, also, other characteristics may be observed to develop locally and be counteracted by fresh importations of seed. Doubtless most characteristics of plants can be developed in desired directions and curtailed in undesired directions by selection and without new importations, but this belongs rather to the realm of plant-breedng than to that of this correspondent's inquiry. So far as reports have been published no disadvantage has been experienced in eastern Kansas from importation of seed from any part of the corn-belt.

For reports of what the experiment station has done along these lines, our correspondent is advised that the reports of the station are sent free of cost to any farmer in Kansas. It will be well to apply to the Experiment Station, Manhattan, Kans., for such literature.

Seed Corn—Rape.

EDITOR KANSAS FARMER:—I have lately read two or three articles stating that it would be risky to use for seed this spring much of the corn grown last year. I have recently purchased some grown near where I live. It is good-looking seed, but in the articles referred to it is claimed the tassels were scorched so that it would not reproduce corn; that only shoots would appear where the ears should be. What is your opinion, or that of some of the readers of your most valuable paper, on the matter?

I would like to know if anybody has had experience with pasturing milch cows on rape. Is there any danger of its tainting the milk enough to be noticed? I wish to sow some for pasture for cows and young cattle. Part of the field is in timothy and red-top. I have never sown any rape, but as it is claimed to be such a prolific forage plant I thought it worth a trial.

C. O. FLINT.

Ottawa, Franklin County.

The inquiry about seed-corn is covered in the answer to an inquiry on page 353 of this paper. The question as to rape is referred to such readers as have had experience with this forage plant.

What is Best to do With Wheat-land on Which There is Only a Partial Stand?

EDITOR KANSAS FARMER:—If 35 per cent or more of the stools possess vitality in both stock and root, the wheat-land should be given a good harrowing as soon as possible and should be cross-harrowed after a few days. This will loosen the land, fill up the cracks and crevices, give the soil a good top dressing that will greatly assist in retaining moisture; and will also, in a large measure, prevent the high winds from blowing away the top soil from around the stools. With favorable weather a good half crop could be produced in fields that now look almost a total failure.

In 1897, by thorough harrowing, I obtained a yield of seventeen bushels per acre of good plump wheat where my neighbors said I would only raise weeds. Heavy fields are plowed up and planted to other crops that could, with proper treatment of the land, produce a fair wheat crop. This breaks the proper rotation and where sowing in corn-stalks is not practical several years will be necessary to bring back the proper order.

Harrow the wheat-fields that show a certain amount of vitality, and give them a chance. It will be time enough to break them up in the latter part of May if it is necessary to do so.

Hiawatha, Kans. J. C. LACROIX.

English Blue-grass.

EDITOR KANSAS FARMER:—L. A. Snapp, Westmoreland, Kans., asks to know where he can obtain English blue-grass seed, how much to sow, and when is the best time to sow it.

I sow eighteen pounds to the acre. I think that fifteen to eighteen pounds is about right. I have 100 acres of English blue-grass; eighteen acres was seeded with twenty-four pounds of seed to the acre, and eighty-two acres was seeded with eighteen pounds to the acre. The latter made a nice, even stand, and is thick enough. One bushel of seed to the acre is too much; the grass comes up too thick in the row, and does not do as well as with thinner seeding.

The last of August is the right time to sow. It is natural for all grasses to re-seed themselves in the early fall, and I think it is the best time to sow this grass-seed. The ground should be plowed as soon after harvest as possible and should be harrowed a number of times to get a solid, even seed-bed. A rooter should be run over the ground just before seeding, to firm the ground so it will hold moisture close enough to the surface to sprout the seed, which should not be covered deeper than three-fourths of an inch.

A grain drill with hoes six inches apart is a good thing to put it in with. My grass is looking fine this spring. I have pastured it all winter. Ten to twenty bushels per acre is a fair yield for seed. D. O. BUELL.

Everest, Brown County.

Johnson-grass—Favorable.

EDITOR KANSAS FARMER:—In your issue of February 20, I notice an article on Johnson-grass from M. R. Davis, stating that it was innutritious. I wish to say that he is very much mistaken. When Johnson-grass is cut at the right stage, before it gets coarse, and is cured properly, it is very nutritious. Cattle like it and will not waste it like they do other hay. It is very fattening, both for horses and cattle. Horses fed on Johnson-grass will keep fat and do more work than animals fed on any other hay. It is not absolutely necessary to feed them any grain.

It will not spread in alkali soil; but in good farming land, where rain is plentiful, it spreads very rapidly, and I would not advise any one to plant it, as it will soon take the field.

The roots also are very fattening. I have heard it said that twenty pounds of Johnson-grass roots will carry an animal through the winter.

Here in western Texas we are paying $15 a ton for Johnson-grass with only thirty-two bales to a ton, and some of us, at this present time, are glad to get it at that, as we are in the midst of a terrible drouth. If Johnson-grass can be irrigated three or four crops a year can be cut. MRS. D. CAMPBELL.

Del Rio, Texas.

Experience with Pensilaria.

EDITOR KANSAS FARMER:—In reply to thy request for experience and observation with pencilaria, I will say that one year ago I sent to an Iowa seed-horse and got a sample package. I planted two rows about fifty feet long. The ground was very dry, and but few seeds came up. All the cultivation I gave it was two hoeings; and I did not do that until I saw it was determined to make something in spite of crab-grass and dry weather, and I hoed it more from pity than faith. It grew so fast under very unfavorable conditions that I observed it closely the balance of the season. It attained a height of from five to eight feet and showed very little signs of discouragement all through the drouth with no cultivation except the two hoeings.

Thirty-three stalks is the most I ever counted from one seed, but I have no doubt the average would be above that with proper treatment with a dense foliage from the ground all the way up. I will have seed enough to plant about two acres. I will plant it with a garden drill twenty-four inches apart with three to six seeds to the foot, so that if one to the foot grows it will be amply thick, and after cultivation will fill the middles full.

A kind of striped worm, like the corn-worm, preyed on the heads some while in bloom, but I shook them off and they appeared no more. They would not likely be noticed on a larger field. From last year's experience it is a good drouth-resister and an immense yielder of forage, as it can be cut several times during the season but only once if the seed is desired.

Thos. D. Hubbard asks if pencilaria is of the Johnson-grass family. I never saw Johnson-grass, but I think that it is not a grass at all but a grain, and reseeds and dies like corn each year. I can only guess at the yield of grain, but it must be heavy, as the heads are from twelve to twenty inches long and thickly set with seed. These are about the size of raddish seed and are filled with a white flour. Owing to the great yield of the seed, which is now very high in price, will only be worth its feeding value in the near future.

Galena, Kans. LEVI BOWLES.

A Suggestion.

EDITOR KANSAS FARMER:—The question. What shall be done with the ground on which the wheat has been killed, is not only a very important one, but one not readily answered. On bottom-land without doubt, the best plan is to plant corn; but on upland or land that is not suitable for corn the solution of the problem appears more difficult.

In the central and western parts of the State, at least, the lateness of the season, together with the high price of seed, makes the wisdom of seeding oats questionable. Many object to Kaffir-corn, thinking that it is a very exhaustive crop, and while fodder crops are always in evidence, yet very few farmers in the wheat-belt would need or could use more than a limited amount. The alternative seems to be wheat or nothing.

Now, taking all things into consideration—the high prices for seed and grain to feed—would it not be as profitable to let the fields grow up to weeds to be plowed under during July? Without a doubt our soil is beginning to need some treatment that will restore the humus that has been exhausted by many years of continuous cropping. It is a common remark among old settlers that Kansas soil is losing its drouth-resisting qualities. Possibly the course suggested would prove more profitable than a crop of wheat.

To be sure, this idea will not appeal to those who as renters from year to year are not interested in maintaining the fertility of the farms they till; but it is a subject that can not be ignored forever. AURUS FABER.

Abilene, Dickinson County.

Growing Kaffir-corn on Sod.

EDITOR KANSAS FARMER:—Having received no small amount of valuable information relative to farming in Kansas from the editors and contributors of the KANSAS FARMER, I now take the liberty of saying a few things, or rather writing them, about raising Kaffir-corn on sod, that being what an interested subscriber asked information about a few issues ago.

It may interest some to know that our experience in raising Kaffir-corn or any other crops in the Sunflower State dates back only to the year 1896. On arriving here from northern Nebraska in the spring of that year, we moved onto the farm we bought, which was a mass of weeds, tumble-down buildings, and all that sort of things usually found in the wake of a dozen indifferent renters. Happily for us the former owner of the farm had allowed land to be broken

ly on one eighty; the other two were t in pasture.

We saw at once, if we were going to t anything at all for our first season's rk besides the satisfaction of a hard mmer's work killing weeds, we must t in a crop of some kind where there re no weeds to claim our entire at- ntion. Wishing to break out forty es more land that summer any how, started the breaker early—along the t of April I think—and planted Kaf- corn on the sod until it got so late considered it useless to do so. We d brought a cuataway disk harrow h us, and when we got five acres ke out we went at the sod with the k and cut it up as well as we could, ng over the ground three times be- e putting in the crop. We had nev- seen Kaffir-corn before coming here; had, of course, read much of it. wever, much of that we read was not

The neighbors told us to sow it for der and drill it in rows with a plant- for seed. Not knowing, and perhaps that time not caring—since some of neighbors had told us the place uld not grow anything anyway— ich to put in first. We trusted to k and sowed the first five acres. We rowed it twice after sowing and the p of forage we grew on that five es would astonish the stoical indif- nce of a Sioux Indian. The season, you will remember, was only a nom- l one, but the land was creek bottom. then planted some in drills by hand he edge of every third furrow. This a long time coming through, and le scarcely any seed and only a fair unt of fodder.

he next lot we disked thoroughly as did the first, only after giving the ked ground a harrowing or two we t on with a planter with plates made cially for drilling Kaffir-corn and led the seed in. This we did not cul- te and had, on account of an accom- lating late fall, a very fair crop of n besides quite a lot of fodder. Of rse we know now that the Kaffir-corn is drilled in for a seed-crop wants e planted before that for forage; but hat time, because I suppose we were comers, we heard so many methods rowing the crop advanced, that, like listening to a political speech, we w about as much before as "after ng."

ur subsequent trials with this crop od have confirmed the disking idea. as always been a better crop and a er stand on the disked sod, whether ed or planted, than when planted in edge of the furrow. The increase he yields have also well repaid for extra work connected with cutting sod with a disk and harrowing it as as possible with a harrow. We e now broken all the land that is led; the rest will ramain as pasture meadow. By using a good deal of cle, clover, and team force we have got the old eighty back in line, and nk have satisfied ourselves at least the farm will grow something after

here are no doubt thousands of ngers moving onto farms in "sunny sas" this spring that will be as well rmed about the country as we were, we hope they will not take seriously the information they get. We got of good advice about what to do and to farm here, but at that time we not know which was good and which bad. We now thank those who us the good advice and forgive e who gave us the bad.

HENRY HATCH.

arry, Greenwood County.

Russian Thistle Hay.

DITOR KANSAS FARMER:—In reading article of Mr. Ellsworth McManis, the "short-grass country," where I resided for the last sixteen years, is very forcibly reminded of the fact this part of Kansas at last had n come to the notice of the East. notice in our country papers quite w names of parties who have set- here recently, among whom we may it Mr. McManis. Well, here is a ty welcome to him and may the conviction of the final redemption ood old Thomas County never leave for a moment. It has never left through all our trials and tribula- s.

ne of our worst trials in the last few years has been the Russian thistle; and it cost me no small amount of money by cutting my crops short, till we learned how to deal with it and even to turn it to good account. I herewith send you a sample of the hay of which I have put up more than fifteen tons this last summer.

The field where this Russian thistle was cut had been sown to oats, but the thistles came up so thickly that the oats did no good; so I decided to mow the whole field, which I did the latter part of June. I had an American buncher attached to the mower. I can assure the readers of the KANSAS FARMER that such thistle hay comes as near being a substitute for alfalfa for cows as anything I know of. My milk cows gained in milk as soon as I commenced feeding it and have kept up well all through the cold weather.

Being so well satisfied with this kind of hay, I decided to make a business of raising it every year, as it is almost grasshopper-proof. I have now a field which I know is well seeded down to Russian thistle; and as it is in a good state of cultivation, I shall just clear it of the old thistles and then let the new crop come on. The latter part of June they will be ready to cut. On cutting them I shall crowd over about a foot every fifth round with the mower so as to let this strip grow on maturing to give me the seed for another year. As soon as the hay is hauled off I shall double-disk the mowed space between those uncut strips, thereby killing the mowed thistles and at the same time encouraging the strips to make a better growth. These rows will catch the snow in winter and insure a better crop for the coming season; and after having performed this part, they will be ready to be broken loose in a high wind and the seeding of the ground will be done.

I hope that I may have better success in this than I had with cultivating my barley, of which I told the readers of the KANSAS FARMER last spring. For some reasons the lambs-quarters were worse in the barley which I cultivated than in the other. It was quite a problem for me how to cut it and save it all, as then the drouth and the grasshoppers were with us, and we realized that feed was going to be an object. There we were—rye not filling good, barley weedy, wheat shriveling, and the grasshoppers just working for all they were worth. And in the face of all this harvest-wages were from $1.50 to $2.00 a day for single hands.

"Necessity is the mother of invention," and so it was with me. I went to work and built what I call a header-barge-dump. It was a good deal like a header-barge. It was the same in length—sixteen feet—but only three feet instead of eight feet wide. That is just the width of a wagon bolster from standard to standard. I built it with the low side sloping out like header-barges usually are made.

The wagon on which this small header-barge rested was coupled up the same as it is for a common wagon-box, so that the header-barge extends seven feet back of the rear axle. The springers are placed against the standards on the front bolster as well as on the rear bolsters, making them parallel throughout. In this header-barge there are only four feet of solid bottom or floor, and that is in front, where the driver stands. The other twelve feet is a tilting bottom, the tilting place being right over the rear axle, so that seven feet of the bottom extends back and five feet extends forward of the tilting place. A sufficient weight is placed in front on the tilting bottom to overbalance the longer and heavier end extending backwards; and as there is a catch placed at the rear end, said bottom will be held in place until sufficient grain has fallen on it to make a good sized shock. Then the driver unlocks the catch by a simple pull and the weight of the grain will cause the rear end of the tilting bottom to come down to the ground, and the whole shock will slide out nicely on the ground, after which the bottom will close itself automatically, not necessitating any stopping whatever. When I state that I have cut my rye, barley, and wheat with no one but my 8-year-old boy, who was running this header-barge-dump, you may know that it was a success in every way; and I can conceive of no way whereby a farmer can put up feed any faster and easier than with a header and such a dump. I cut the rye, barley, and wheat for hay, all while the straw was green, and I expect to do the same every year; but shall only cut in this way as much wheat as I need for feed. The balance I shall head and put in the stack to be threshed.

G. R. WERNER.

Colby, Thomas County.

Underground Crop Production, or the Economic Relation of Micro-Organic Life in the Soil to Crops.

EDITOR KANSAS FARMER:—The subject of crop-production is one of almost unlimited importance—we might even say supremely so, for as the sage and historian tell us, a nation's prosperity is inseparably linked with the prosperity of its producing masses—the people. But they say more: that this foundation of prosperity rests with the farming classes, and we will not deny it because our education system has made them the best informed class of people on earth and their constant communion with Nature have given them, instead of the perverted desires of the inhabitants of our great business centers, an integrity of purpose and honesty of intention that has made the farmer on his farm a king. Considering as settled the proud position of the farm and the farmer, let us come to the consideration of the subject of crop-production.

Crop-production is preeminently the farmer's business; and he as a business man must consider his work from all points of view and then select such facts or methods as will prove beneficial to him in his particular line whether it be wheat, corn, alfalfa, or milk. In regard to methods of preparation of soil, time of seeding, character of seed, cultivation, harvesting, and even feeding the product there exists as many different ideas as there are producers; and this is, in a manner, right, for all farmers, even neighbors, may have to work under conditions so different as to call for entirely different methods along some lines. This is certainly true of different sections of our great Nation and of States, for different climatic conditions or widely different soils call for perhaps opposite methods of treatment in order to secure the best returns.

THE VERY LITTLE HELPERS.

In our subject we refer to micro-organic life; and before we attempt to consider the relation they bear to crop-production, we must first consider them as to what they are, their shape, size, habitat, and life history in a general way. We will refer to them in this discussion as bacteria, germs, microbes, and ferments. All these organisms are very small, in fact they can only be studied by the aid of a powerful microscope. We find them varying from one twenty-five thousandth to one twenty-five hundredth of an inch in length. We can hardly conceive how minute these are, but it may be helpful to our conception to say that an almost countless number can live and swim about in a single drop of water. In shape we find all variations—the spherical or roundish; the rods—bent, straight, or curved; and the long stringy or thread-like form. These three general classes and their subdivisions comprise the most of the well-known of classes of bacteria with which we deal.

We will draw a simple analogy which will perhaps be beneficial in explaining a complex process. Man in his daily life consumes food. This food is composed of fats, starches, and albuminoids. These food elements are unfit to be built into the body tissues until they have been torn down by the digestive juices and built into new material which can be assimilated or built into muscle, bone, or brain. Just so with the plant; only, as we shall see, the digestive juices of man are replaced in plant growth by the peculiar action of the microbe in the soil. We call the elements composing plant food nitrogen, phosphoric acid, and potash. These elements in varying quantities exist in commercial fertilizer, farm manures, decaying straw or leaves, or in fact any decaying vegetation or partially decompcsed organic matter. These elements can not be used by the plant while in this form but must be digested, torn down, and built into a new and soluble substance. This is the process known as nitrification, and in the rest of this paper we will confine our study to the first named element, viz., nitrogen, and its metamorphosis.

HOW PLANTS FEED.

Before considering plant food it will be well to notice how plants feed. Each plant is composed of stem and root system. The roots give the plant its crude nourishment in a soluble state, which is carried along by water in its upward passage. The entire absorbing process is provided for by an infinite number of root-hairs, almost microscopic in size yet each possessing the definite function of absorbing liquids containing plant food in solution. Knowledge of plant food is of comparatively recent date, because it is only of late years that we have had a definite understanding of plant-feeding.

We now have the assurance that the crude food is assimilated into plant tissue by the specific action of three classes of microbes.

Plant growth requires the three distinct food-elements above-mentioned, and as we stated, it is in the first of these that we are particularly interested. The required nitrogen can only be taken up by the root system of the plant when in the soluble form of nitrates. If, then, nitrates are of such importance, it is well that we should know something of the conditions which favor their formation. Soil containing animal or vegetable substances, will, if exposed, produce these nitrates, and as the physical conditions are more favorable the nitrates are formed more and more rapidly; as when the heat of summer increases. These nitrates are peculiar substances in that they are not the product of an oxidation, nor are they the result of plain chemical reaction but are produced by the action of microscopic organized ferments. We do not know the exact action of these ferments, but we find that when examined under the microscope they look like the yeast fungus and by careful study we learn something of their habits. There are three conditions essential to their growth: moisture, darkness, and warmth; and without these three or any one of them the plant refuses to grow. The kind of soil in which they make their home makes but little difference so long as there is some decaying organic matter present and they have the three above-named conditions.

The microscopist has been able to determine three distinct species of these little plants, and that each species has its specific function. The first causes the early stages of decay in organic matter and sets free ammonia gas. The second species combines this free ammonia with the free oxygen of the air,

(Continued on page 359.)

The Stock Interest.

THOROUGHBRED STOCK SALES.

Dates claimed only for sales which are advertized or are to be advertized in this paper.

March 25-27, 1902—National Hereford Exchange, Chicago, Ill. (Sotham management.)
April 1, 1902—M. Sooter, Lockwood, Mo., Shorthorns.
April 8 and 9, 1902—Breeders' Combination Sale of Herefords, at Kansas City, Mo.
April 15, 1902—Geo. H. Augustus, Kansas City, Mo., Shorthorns.
April 16, 1902—Geo. Bothwell, Nettleton, Mo., Shorthorns.
April 16, 1902—W. O. Park, Atchison, Kans., Aberdeen-Angus.
April 22-24, 1902—National Hereford Exchange, Kansas City, Mo. (Sotham management.)
April 25 and 26, 1902—H. O. Tudor, Holton, Kans., Shorthorns.
May 7 and 8, 1902—Colin Cameron, Kansas City, Arizona Herefords.
May 27-29, 1902—National Hereford Exchange, Omaha, Neb. (Sotham management.)
June 24-26, 1902—National Hereford Exchange. Chicago, Ill. (Sotham management.)

The Exact Calculation of Balanced Rations.

PROF. J. T. WILLARD, IN THE INDUSTRIALIST.

The calculation of balanced rations has thus far seemed to be entirely a matter of "cut and try." Their exact calculation has been a mathematical problem which apparently has been found too difficult for solution, or has not been attacked with sufficient persistence. The approximation of the correct figures by guess and trial, followed by another guess or two, is a time-destroying and patience-testing process. By the method about to be described, rations can be exactly balanced, with less work, especially if certain factors which are constant for each feed are known. A rule for this calculation is given at the close of this article, which may be followed with perfect confidence even if the user does not understand the principles upon which it is based, but as many will be interested in a full understanding of the method, it will be described with as much clearness and simplicity as the ability of the author can command, and the nature of the subject permits.

The method of exactly balancing rations by direct calculation depends on the principles of alligation, a somewhat neglected chapter in arithmetic, and perhaps the solution of a simple problem in alligation will suitably introduce the more complex problem of calculating rations. Suppose that a grocer has two grades of tea worth 20 cents and 50 cents per pound respectively, and wishes to make a mixture of them which shall be worth 30 cents per pound, what amounts must he take of each? It will be seen that for each pound of the 50-cent tea that he uses he will lose 20 cents, and that on each pound of the 20-cent tea he will gain 10 cents. He must therefore put in two pounds of the 20-cent tea for each pound of the 50-cent tea. To put the matter another way, the total amount that the grocer gains on the one tea must be exactly equal to the total amount that he loses on the other, and consequently the quantities of each required will be inversely proportional to the amount gained or lost on one pound in each case. Hence the amount required of the first, is to the amount required of the second, as the gain (or loss) on each pound of the second is to the loss (or gain) on each pound of the first. On each pound of the first tea used the grocer gains 10 cents; on each pound of the second he loses 20 cents; hence the quantity to be used of the first, is to the quantity to be used of the second as 20 is to 10 or as 2 is to 1. The following calculation shows the correctness of these proportions:

Cts.	Difference.	
50	10	=pounds to be taken at 50 cts.
30		
20	20	=pounds to be taken at 20 cts.

Proof:

10 pounds at 50 cents are worth $5.00
20 pounds at 20 cents are worth 4.00

30 pounds at 30 cents are worth $9.00

It is evident, also, that any other quantities may be taken that are in the ratio of 10 to 20, for example 5 to 10, 2 to 4, or 15 to 30.

Let us take another example: Suppose the grocer wishes to mix five kinds of tea worth 20, 25, 30, 35, and 40 cents, so as to obtain a mixture worth 28 cents. Separating these into two groups as explained above we have 20 and 25 in the group having values less than the mean to be obtained, and 30, 35, and 40 having values greater than the mean. We may pair them and take the differences as follows:

Cts.	Difference.		
30	8	=pounds to be taken at 30 cents, value	$2.40
28			
20	2	=pounds to be taken at 20 cents, value	.40
	10	=pounds at 28 cents give a total value of	$2.80
35	3	=pounds to be taken at 35 cents, value	$1.05
28			
25	7	=pounds to be taken at 25 cents, value	1.75
	10	=pounds at 28 cents give a total value of	$2.80
40	3	=pounds to be taken at 40 cents, value	$1.20
28			
25	12	=pounds to be taken at 25 cents, value	3.00
	15	=pounds at 28 cents give a total of	4.20

It will be seen that each pair produces a mixture of the required composition. These pairs may therefore be taken in any quantities desired, only being certain that if the quantity of one member of a pair is altered the quantity of the other member is altered in the same ratio.

Adding together the above quantities and amounts we have the following:

Pair 1	8 lbs.	30-cent tea are worth	$2.40
	2 lbs.	20-cent tea are worth	.40
Pair 2	3 lbs.	35-cent tea are worth	1.05
	7 lbs.	25-cent tea are worth	1.75
Pair 3	3 lbs.	40-cent tea are worth	1.20
	12 lbs.	25-cent tea are worth	3.00
Totals	35 lbs.	28-cent tea are worth	$9.80

It will be noticed that the 25-cent tea is used in both the second and third pairs, so that the total amount of that to be used is 19 pounds. Suppose now that the grocer has a large quantity of the 35-cent tea which he wishes to use. Since each pair is exactly balanced within itself, he may use 30 pounds of the 35-cent tea but must offset that by 70 pounds of the 25-cent tea as shown in pair (2); that is, if he takes ten times as much of the 35-cent tea he must take ten times as much of the 25-cent tea as was required to balance it, not ten times 19, that is the total amount of the 25-cent tea, since 12 pounds of the 19 pounds went to balance the 40-cent tea. The values could have been paired in any other way, provided only than one less than the mean is always paired with one greater than the mean. This, with the fact mentioned that the quantities obtained in any pair may be multiplied or divided at will, enables him to adapt his mixture to the amounts of the several grades that he has.

The problem of the tea has been treated thus minutely since the principles involved in its solution are used in the balancing of rations. The latter case involves another complication or two, however, which will be treated at the proper place.

In balancing rations, the problem primarily is not one of balancing values, which could be done in the manner indicated above, but in balancing the energy obtainable from nitrogenous organic constituents of feeds against that obtainable from non-nitrogenous organic constituents; the protein against the fats and carbohydrates. The ratio of the energy that can be obtained from the protein, to the energy that can be obtained from the fats plus the carbohydrates is called the nutritive ratio. In calculating this ratio, since fats give about two and one-fourth times as much energy as protein or carbohydrates, we multiply the amount of the fats by two and one-fourth to reduce them to an equivalent amount of protein or carbohydrates.

In the discussion which follows, since the energy yielded by a food principle is directly proportional to its weight, weights will be considered rather than energy values, and to simplify expression, protein will mean the nitrogenous substances of the feeds, and non-protein will mean fats multiplied by two and one-fourth, plus carbohydrates.

When we speak of a fed having a nutritive ratio of 1 to 5, then, we mean that in a quantity sufficient to contain 1 pound of protein, the weight of the carbohydrates plus two and one-fourth times the weight of the fats will be 5 pounds, or to use the simplified form of expression, the protein is to the non-protein as 1 is to 5.

In applying the principles of alligation to the calculation of the quantities of each of two feeds with different nutritive ratios, that must be taken to produce a mixture that will have a definite nutritive ratio of any intermediate value, we must deal not with equal weights as units, but with weights of each that contain equal weights of protein. Figures proportional to these weights are obtained by dividing 100 by the percentage of protein contained in the feeds respectively. Thus, if a feed contains 5 per cent of protein 100 pounds of it will contain 5 pounds, and 100 divided by 5, that is 20, is the number of pounds that will contain 1 pound of protein. Similarly if a feed contains 12.5 per cent of protein, 100 divided by 12.5, that is 8, will be the number of pounds of the feed that will contain 1 pound of protein. I propose to call the quotient obtained by dividing 100 by the per cent of protein, the protein-equating factor. Let us proceed then, remembering that our units are to contain equal weights of protein, that is, they will contain as many units of weight, say pounds for instance, as are expressed by the protein-equating factors.

To simplify calculations let us assume that we have two feeds, a and b, containing the following percentages of digestible constituents:

	Protein.	Carbohydrates.	Fat.
a	5.0	65.5	2.0
b	12.5	68.25	3.0

The nutritive ratio of a is calculated as follows: Multiply the fat by 2¼, and add it to the carbohydrates to get the non-protein term. 2¼ times 2 gives 4.5. This added to 65.5 gives 70. The protein is to the non-protein as 5 is to 70, therefore. Dividing both terms of the ratio by 5 to make the protein unity, we get the ratio, 1:14, as the nutritive ratio of feed a. Proceeding in the same way with feed b, 3 times 2¼ gives 6.75, which added to 68.25 gives 75. The nutritive ratio then is 12.5 to 75, or 1:6.

The protein-equating factors of each are found by dividing 100 by the respective percentages of protein. 100 divided by 5 gives 20 as the protein-equating factor of a, and 100 divided by 12.5 gives 8 as the protein-equating factor for b. Collecting all these data in one view, we have:

	Protein.	Carbohydrates.	Fat.	Nutritive ratio.	Protein-equating factor.
a	5.0	65.5	2.0	1:14	20
b	12.5	68.25	3.0	1:6	8

Let it be required to make from these two feeds a mixture the nutritive ratio of which is 1:9. Regarding this as a problem in alligation, in reference to the second terms of the ratios, we have:

		Second term of ratio.	Difference.
Mixture	a	14	3
		9	
	b	6	5

The numbers 3 to 5 obtained, give with a and b, respectively, the number of times that a weight of the feed containing 1 pound of protein must be taken. In other words, those figures multiplied by the protein-equating factors will give the number of pounds of each that must be taken to produce the required mixture.

Let us see that this is true. The protein-equating factor for a is 20, which multiplied by 3 gives 60 as the number of pounds of a required. The protein-equating factor of b is 8, which multiplied by 5 gives 40, the number of pounds of b that are required. Calculating from the percentage composition the weights of each food principle contained in these weights of the two feeds, we have the following:

		Protein.	Carbohydrates.	Fat.	
	a	.05	.655	.02	
		60	60	60	
Pounds:		3.00	39.300	1.20 X 2¼	=2.70.
	b	.125	.6825	.03	
		40	40	40	
Pounds:		5.000	27.3000	1.20 X 2¼	=2.70.

Collecting quantities, we have:

	39.3
	27.3
3	2.7
5	2.7

8 lbs. protein. 72.0 lbs. non-protein.

Hence the nutritive ratio is 8:72, or 1:9.

Let us now apply the method to the balancing of a ration consisting of corn

	Protein.	Carbohydrates.	Fat.	Nutritive ratio.	Protein-equating factor.
Corn	7.14	66.12	4.97	1:10.826	14.0
Alfalfa	10.58	37.33	1.38	1: 3.82	9.45

2 pounds at 20 cents are worth..40 cents
1 pound at 50 cents is worth..50 cents

Adding: 3 pounds of the mixture are worth..90 cents, or 30 cents per pound.

The analysis of this problem is so simple that one can solve it almost by inspection. If the values were in less simple ratios the case would be more difficult, and the arithmetics give a somewhat mechanical method of solving problems in alligation something as follows: Arrange the several values, including the mean to be produced in order of their magnitude, or at least bringing all values below the mean in one group and all values above the mean in another. Then pair off these values so that each one is balanced against one in the other group. In case the values are not equal in number in the two groups, it will be necessary to balance one or more in one of the groups against more than one in the other group. Consider then one pair at a time. Find the difference between each value and the desired mean value, and set this opposite the other value. Each difference will represent the amount to be taken of the article of the value opposite which the difference is set. Of course, other amounts which are in the same ratio may be taken instead of the quantities represented by the differences. Proceed in this way with all the pairs. If a value is paired with more than one in the other group, the differences set opposite this value are added together to get the total amount to be taken of the article having that value. It must not be forgotten, however, that this quantity is a sum, and if any variation in its amount is desired all of the items paired with it in the other group must be varied in the same proportion. If this is not desirable each pair may be separately multiplied or divided in any way that one wishes, before adding the several amounts set opposite the values.

Applying these directions to the problem previously solved, we arrange the values and differences as follows, the mean being in boldface type:

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50	10	=pounds to be taken at 50 cts.
30		
20	20	=pounds to be taken at 20 cts.

Proof:

10 pounds at 50 cents are worth $5.00
20 pounds at 20 cents are worth 4.00

30 pounds at 30 cents are worth $9.00

It is evident, also, that any other quantities may be taken that are in the ratio of 10 to 20, for example 5 to 10, 2 to 4, or 15 to 30.

Let us take another example: Suppose the grocer wishes to mix five kinds of tea worth 20, 25, 30, 35, and 40 cents, so as to obtain a mixture worth 28 cents. Separating these into two groups as explained above we have 20 and 25 in the group having values less than the mean to be obtained, and 30, 35, and 40 having values greater than the mean. We may pair them and take the differences as follows:

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25	7	=pounds to be taken at 25 cents, value	1.75
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It will be seen that each pair produces a mixture of the required composition. These pairs may therefore be taken in any quantities desired, only being certain that if the quantity of one member of a pair is altered the quantity of the other member is altered in the same ratio.

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It will be noticed that the 25-cent tea is used in both the second and third pairs, so that the total amount of that to be used is 19 pounds. Suppose now that the grocer has a large quantity of the 35-cent tea which he wishes to use. Since each pair is exactly balanced within itself, he may use 30 pounds of the 35-cent tea but must offset that by 70 pounds of the 25-cent tea as shown in pair (2); that is, if he takes ten times as much of the 35-cent tea he must take ten times as much of the 25-cent tea as was required to balance it, not ten times 19, that is the total amount of the 25-cent tea, since 12 pounds of the 19 pounds went to balance the 40-cent tea. The values could have been paired in any other way, provided only than one less than the mean is always paired with one greater than the mean. This, with the fact mentioned that the quantities obtained in any pair may be multiplied or divided at will, enables him to adapt his mixture to the amounts of the several grades that he has.

The problem of the tea has been treated thus minutely since the principles involved in its solution are used in the balancing of rations. The latter case involves another complication or two, however, which will be treated at the proper place.

In balancing rations, the problem primarily is not one of balancing values, which could be done in the manner indicated above, but in balancing the energy obtainable from nitrogenous organic constituents of feeds against that obtainable from non-nitrogenous organic constituents; the protein against the fats and carbohydrates. The ratio of the energy that can be obtained from the protein, to the energy that can be obtained from the fats plus the carbohydrates is called the nutritive ratio. In calculating this ratio, since fats give about two and one-fourth times as much energy as protein or carbohydrates, we multiply the amount of the fats by two and one-fourth to reduce them to an equivalent amount of protein or carbohydrates.

In the discussion which follows, since the energy yielded by a food principle is directly proportional to its weight, weights will be considered rather than energy values, and to simplify expression, protein will mean the nitrogenous substances of the feeds, and non-protein will mean fats multiplied by two and one-fourth, plus carbohydrates.

When we speak of a fed having a nutritive ratio of 1 to 5, then, we mean that in a quantity sufficient to contain 1 pound of protein, the weight of the carbohydrates plus two and one-fourth times the weight of the fats will be 5 pounds, or to use the simplified form of expression, the protein is to the non-protein as 1 is to 5.

In applying the principles of alligation to the calculation of the quantities of each of two feeds with different nutritive ratios, that must be taken to produce a mixture that will have a definite nutritive ratio of any intermediate value, we must deal not with equal weights as units, but with weights of each that contain equal weights of protein. Figures proportional to these weights are obtained by dividing 100 by the percentage of protein contained in the feeds respectively. Thus, if a feed contains 5 per cent of protein 100 pounds of it will contain 5 pounds, and 100 divided by 5, that is 20, is the number of pounds that will contain 1 pound of protein. Similarly if a feed contains 12.5 per cent of protein, 100 divided by 12.5, that is 8, will be the number of pounds of the feed that will contain 1 pound of protein. I propose to call the quotient obtained by dividing 100 by the per cent of protein, the protein-equating factor. Let us proceed then, remembering that our units are to contain equal weights of protein, that is, they will contain as many units of weight, say pounds for instance, as are expressed by the protein-equating factors.

To simplify calculations let us assume that we have two feeds, a and b, containing the following percentages of digestible constituents:

	Protein.	Carbohydrates.	Fat.
a	5.0	65.5	2.0
b	12.5	68.25	3.0

The nutritive ratio of a is calculated as follows: Multiply the fat by 2¼, and add it to the carbohydrates to get the non-protein term. 2¼ times 2 gives 4.5. This added to 65.5 gives 70. The protein is to the non-protein as 5 is to 70, therefore. Dividing both terms of the ratio by 5 to make the protein unity, we get the ratio, 1:14, as the nutritive ratio of feed a. Proceeding in the same way with feed b, 3 times 2¼ gives 6.75, which added to 68.25 gives 75. The nutritive ratio then is 12.5 to 75, or 1:6.

The protein-equating factors of each are found by dividing 100 by the respective percentages of protein. 100 divided by 5 gives 20 as the protein-equating factor of a, and 100 divided by 12.5 gives 8 as the protein-equating factor for b. Collecting all these data in one view, we have:

	Protein.	Carbohydrates.	Fat.	Nutritive ratio.	Protein-equating factor.
a	5.0	65.5	2.0	1:14	20
b	12.5	68.25	3.0	1:6	8

Let it be required to make from these two feeds a mixture the nutritive ratio of which is 1:9. Regarding this as a problem in alligation, in reference to the second terms of the ratios, we have:

		Second term of ratio.	Difference.
Mixture	a	14	3
		9	
	b	6	5

The numbers 3 to 5 obtained, give with a and b, respectively, the number of times that a weight of the feed containing 1 pound of protein must be taken. In other words, those figures multiplied by the protein-equating factors will give the number of pounds of each that must be taken to produce the required mixture.

Let us see that this is true. The protein-equating factor for a is 20, which multiplied by 3 gives 60 as the number of pounds of a required. The protein-equating factor of b is 8, which multiplied by 5 gives 40, the number of pounds of b that are required. Calculating from the percentage composition the weights of each food principle contained in these weights of the two feeds, we have the following:

		Protein.	Carbohydrates.	Fat.	
	a	.05	.655	.02	
		60	60	60	
Pounds:		3.00	39.300	1.20 X 2¼	=2.70.
	b	.125	.6825	.03	
		40	40	40	
Pounds:		5.000	27.3000	1.20 X 2¼	=2.70.

Collecting quantities, we have:

	39.3
	27.3
3	2.7
5	2.7

8 lbs. protein. 72.0 lbs. non-protein.

Hence the nutritive ratio is 8:72, or 1:9.

Let us now apply the method to the balancing of a ration consisting of corn

and alfalfa. The percentages of digestible nutrients, nutritive ratios and protein-equating factors are shown in the following table:

The nutritive ratio of corn given above is calculated as follows:

$$\frac{7.14:(4.97\times2\tfrac{1}{4})+66.12}{7.14}=1:10.826.$$

The protein-equating factor for corn is: 100÷7.14=14.0.

The nutritive ratio of alfalfa is:

$$\frac{10.58:(1.38\times2\tfrac{1}{4})+37.33}{10.58}=1:3.82.$$

The protein-equating factor for alfalfa is: 100÷10.58=9.45.

Let it be required to calculate what amounts of alfalfa and corn of the above composition must be mixed to produce a balanced ration for fattening cattle in the first period, the nutritive ratio to be 1:6.5, according to the Wolff-Lehmann standard.

Applying the methods of calculation described, we have:

	Second term of ratio.	Difference.		Protein-equating factor.		Relative quantities.
Corn	10.826	2.68	X	14.0	=	37.52
Proposed	6.50					
Alfalfa	3.82	4.326	X	9.45	=	40.88

That is, 37.52 of corn with 40.88 pounds of alfalfa of the composition specified will produce a mixture having the nutritive ratio 1:6.5.

Proof:

37.52 X .0714=2.680=lbs. protein in 47.52 lbs. corn.
40.88 X .1058=4.325=lbs. protein in 40.88 lbs. alfalfa.

7.005=lbs. protein in 78.40 lbs. corn and alfalfa.
37.52 X .6612=24.81=lbs. carbohydrates in 37.52 lbs. corn.
40.88 X .3733=15.26=lbs. carbohydrates in 40.88 lbs. alfalfa.

40.07=lbs. carbohydrates in 78.40 lbs. corn and alfalfa.
37.52 X .0497=1.865=lbs. fat in 37.52 lbs. corn.
40.88 X .0138=0.564=lbs. fat in 40.88 lbs. alfalfa.

2.429=lbs. fat in 78.40 lbs. corn and alfalfa.

Calculating the nutritive ratio:

$$\frac{7.005:40.07+(2.429\times2\tfrac{1}{4})}{7.005}=1:6.5,$$

which is the proposed nutritive ratio.

Let us now calculate the proportion in which corn stover and alfalfa must be taken to produce a mixture in which the nutritive ratio is 1:6.5. The following table shows the composition, the nutritive ratios and the protein-equating factors of these feeds:

	Protein.	Carbohydrates.	Fat.	Nutritive ratio.	Protein-equating factor.
Corn Stover	1.98	33.16	0.57	1:17.39	50.51
Alfalfa	10.58	37.33	1.38	1: 3.82	9.45

	Second term of ratio.	Difference.		Protein-equating factor.		Pounds required.
Corn Stover	17.39	2.68	X	50.51	=	135.36
Proposed	6.50					
Alfalfa	3.82	10.89	X	9.45	=	102.91

That these quantities are correct has been proved by making the necessary calculations in the same manner as with the ratio of corn and alfalfa.

We now have two mixtures which possess the same nutritive ratio; let us call the first one A and the second one B. The following table shows certain data concerning them:

	Total lbs.	Protein, lbs.	Carbohydrates, lbs.	Fat, lbs.	Nutritive ratio.	Ratio of fat to carbohydrates.
A:						
Corn	37.52	2.68	24.81	1.86	1:10.826	
Alfalfa	40.88	4.32	15.26	0.56	1: 3.82	
Mixture	78.40	7.00	40.07	2.42	1: 6.5	1:16.55
B:						
Corn stover	135.36	2.68	44.88	0.77	1:17.39	
Alfalfa	102.91	10.89	38.42	1.42	1: 3.82	
Mixture	238.27	13.57	83.30	2.19	1: 6.5	1:38.03

We have, then, in A and B two mixtures with the same nutritive ratio, and may therefore combine these mixtures in any proportion, and the nutritive ratio of the compound mixture will be the same, viz., 1:6.5. Now if we compare A and B in respect to relative amounts of fat and carbohydrates, the two groups of substances composing the non-protein, we see that they differ materially. In A the fats are to the carbohydrates as 1:16.55, while in B the ratio is 1:38. According to the Wolff-Lehmann standards the ratio of fats to carbohydrates in a ration for fattening cattle during the first period should be 1:30. It may well be doubted whether it is necessary or even best to reduce the fat to so low a proportion, but, be that as it may, our method enables us to calculate the exact amounts that must be taken of each of two feeds of mixtures possessing the same nutritive ratio, but one having too much fat and the other too little. We proceed exactly as in balancing the ration as to protein and non-protein, except that we must calculate a fat-equating factor for each feed or mixture to be used. This factor, represents the number of pounds that must be taken to get a pound of fat in the several cases, and is obtained by dividing the total weight by the amount of fat. Thus, in A we have, in a total of 78.40 pounds, 2.42 pounds of fat. 78.40 divided by 2.42 gives 32.4, which is the number of pounds of that mixture necessary to use in order to get one pound of fat, and is the fat-equating factor of A. In B, in a total of 238.27 pounds, we have 2.19 pounds of fat. 238.27 divided by 2.19 gives 108.8 which is the number of pounds of B that contains one pounds of fat, and is the fat-equating factor for B.

Proceeding by alligation as before, we get the following:

	Second term of ratio.	Difference.		Fat-equating factor.		Pounds required.
Mixture B	38.03	13.45	X	108.8	=	1463.36
Standard	30.					
Mixture A	16.55	8.03	X	32.4	=	260.17

From this we see that 260.17 pounds of A will be required for 1463.36 pounds of B.

Proof: In the compound mixture we have 260.17÷78.4=3.318 units of mixture A, and 1463.36÷238.27=6.141 units of mixture B. Calculating the quantites of fats and of carbohydrates which these quantities contain, we have:

3.318 X 2.42= 8.03 lbs. fat in 260.17 lbs. of mixture A.
6.141 X 2.19=13.45 lbs. fat in 1463.36 lbs. of mixture B.

21.48 lbs. fat in compound mixture.
3.318 X 40.07=132.95=lbs. carbohydrates in 260.17 lbs. of mixture A.
6.141 X 83.3 =511.54=lbs. carbohydrates in 1463.36 lbs. of mixture B.

644.49=lbs. carbohydrates in compound mixture.

21.48 is to 644.49, as 1 is to 30, the proposed ratio of fats to carbohydrates.

For use later, we may at this point calculate in a similar manner the total amount of digestible protein in the compound mixture.

3.318 X 7.00=23.23=lbs. of protein in 260.17 lbs. of mixture A.
6.141 X 13.57=83.33=lbs. of protein in 1463.36 lbs. of mixture B.

106.56=lbs. of protein in the compound mixture.

The quantities of corn, alfalfa, and corn stover required to compound a ration in which the nutritive ratio is 1:6.5, and the ratio of fats to carbohydrates is 1:30, are found by the following calculations:

37.52, the pounds of corn in A, multiplied by 3.318, the units of A used, gives a product of 124.49, the corn required.

40.88, the pounds of alfalfa in A, multiplied by 3.318, the units of A used, gives 135.64 as the number of pounds of alfalfa required in A for the compound mixture.

135.36, the pounds of corn stover in B, multiplied by 6.141, the number of units of B used, gives 831.25, the amount of corn stover required.

102.91, the pounds of alfalfa in B, multiplied by 6.141, the units of B used, gives 631.97 as the alfalfa in B required for the compound mixture.

Adding together the quantities of alfalfa, we have the following:

Alfalfa, 767.61 pounds; corn stover, 831.25 pounds; corn, 124.49 pounds; total, 1723.35.

These figures represent the proportion in which these three feeds must be mixed to produce a ration with the nutritive ratio 1:6.5, and with the fats to the carbohydrates as 1 is to 30. Any change of one only of these quantities will alter these ratios. The component A or B may be altered to any desired extent without altering the nutritive ratio, but the ratio of fats to carbohydrates would be changed. Since fats and carbohydrates can to a considerable extent replace each other in a ration, it seems almost certain that for Western practice it would be better to use more of mixture A, and therefore more corn, and less of mixture B, and therefore less corn stover. The nutritive ratio would thus be preserved, but the proportion of fat would be increased. However, the object of this article is not to discuss any particular ration, but to show that a ration can be calculated exactly which will possess a given nutritive ratio, and a given relation between fat and carbohydrates. The preceding calculations demonstrate this, and the principles there illustrated are capable of still greater extension by application of the same general method.

It was shown above that the 1723.35 pounds contain 106.56 pounds protein, 644.49 pounds carbohydrates, and 21.48 pounds fat, or a total of 772.53 pounds of these nutrients. In this ration then we may readily calculate the percentage of total digestible nutrients, and it is found to be 44.82. From this the amount to be fed to obtain any desired amount of digestible nutrients is readily computed.

From the principles illustrated in the preceding examples we may derive the following:

Rules for the exact calcluation of balanced rations:

1. Unless shown in tables, calculate the nutritive ratio of the ration to be compounded, and each of the feeds entering into it. To do this, multiply the percentage of fat by 2¼, add the product to the percentage of carbohydrates, and divide the sum by the percentage of protein. The quotient will be the second term of the ratio, the first being 1, since protein has been made unity by taking it as the divisor.

2. Unless shown in tables, calculate the protein-equating factor for each feed by dividing 100 by the percentage of protein contained in the feed. The quotient will show the number of pounds of the feed that must be taken to get 1 pound of protein, and is the protein-equating factor.

3. Compare the second term of the nutritive ratio of the ration to be compounded with that of each feed that is to enter into it by arranging these second terms for the several feeds in two groups, placing all greater than that from the proposed ration in one group, and all less in the other. Pair off the second terms in one group against those in the other. If the items in the two are not equal in number, pair one or more in the group having the smaller number of items against two or more in the other group.

4. Consider now each pair separately. Mark each second term with the name of the feed from which it is derived. Find the difference between each second term and the second term for the proposed ration, and set each difference opposite the name of the other feed. Each difference multiplied by the protein-equating factor for the feed opposite the name of which it is set will give the number of units of weight to be used of that feed. Proceed with each pair in the same manner. Each pair will then constitute a ration having the required nutritive ratio. The several pairs may then be mixed in any desired quantities to compound the ration, only remembering that each pair must be taken in its entirety, and the two items in it always taken in the ratio indicated by the units of weight obtained. These units may be multiplied or divided in any way desired, provided that the ratio between them is kept the same. If a feed has been paired with more than one other, the units of weight obtained for that feed in the several pairs must be kept separate until the amounts of each pair to be taken have been determined. Finally, all the quantities for each feed are united, but in this sum a part may balance one feed, another part another.

5. To provide the fat and the carbohydrates in quantities that shall possess a given ratio to each other, and at the same time have a definite nutritive ratio for the ration, it is necessary to have two or more feeds or mixtures of feeds that have the required nutritive ratio, one or more of which has too much fat and one or more too little fat. Calculate a fat-equating factor for each of these feeds or mixtures of feeds by dividing the weight of a given amount of the feed by the weight of the fat which that amount contains. The fat-equating factor is thus the number of pounds of feed having the desired nutritive ratio that contains one pound of fat.

6. For the ration to be made, and for each of the feeds or mixtures of feeds that is to enter into it, calculate the ratio of the fat to the carbohydrates. Make the first term of the ratio 1 and let it represent the fat by dividing the quantity of carbohydrates by the quantity of fat. The quotient will be the second term of the ratio. Arrange the second terms in two groups, one of which shall contain all that are greater than that of the proposed ration, and the other all that are less. Pair off the second terms as before, marking each with the name of the feed to which it belongs. Consider each pair separately; find the difference between each second term and that of the proposed ration, and set each difference opposite the name of the other feed or mixture of feeds. Each difference multiplied by the fat-equating factor for the feed opposite the name of which it is set will give the units of weight to be taken of that feed or mixture. Proceed with each pair in the same way. Each pair, taking its components in the proportions indicated by the units of weight, will constitute a ration having the required nutritive ratio, and having the required ratio between the fat and carbohydrates. If more than one pair have been thus balanced, they may be mixed with each other in any proportion desired. It will be seen that by proceeding in a similar manner the ration, if desired, might be balanced in still other respects, for example, in percentage of

digestible matter. The process could be continued until it had been applied to all of the imaginable differences, being limited only by the composition of available feeds.

7. The weight of digestible matter in the ration may be calculated by obvious processes, by means of the quantities used, and the percentage of digestible nutrients which they contain.

It is apparent that the labor of calculation may be much abridged by the use of tables which show the nutritive ratios, and the protein-equating factors with the composition of the feeds. It is the purpose of the writer to prepare a bulletin containing such tables, and including fuller illustrations of this method of calculating rations.

Breeding.

HON. J. W. ROBISON, BEFORE THE AGRICULTURAL CLASS AT THE KANSAS STATE AGRICULTURAL COLLEGE. SYNOPSIS BY PROF. W. H. OLIN.

Breeding is creating a new variety; cuttings only propagate varieties. We do all we can in breeding to develop a specific type for specific use. We should never attempt to produce an all-purpose animal any more than we do an all-purpose plant. Begin with the best that has already been produced; take from where you live, the best that has been produced up to date. Don't throw away years of usefulness by breeding up what some one else has already accomplished.

Make the very best possible use of yourself, it is a duty you owe your parents, your country and your God. Go right on in breeding plants or animals. We have only just begun.

My father was brought to this country from England to build railroads. In the early day they laid the rails on blocks of stone costing $3 to $4. They soon found they had to take this out and put in a 35-cent wood tie.

Improvement is the present call in all lines. In my boyhood days hand rakes were used in the hayfield. The modern horse rake and stacker now do the work of forty men. The first great improvement shown in breeding was by gentlemen of leisure, who bred flowers for a pastime. The chrysanthemum was the one upon which the most important work was done. This flower has been so developed by breeding that at the Paris Exposition recently there were hundreds as large as a modern dinner plate. Individual cuttings often sell for hundreds of pounds sterling.

In the animal kingdom the same thing is shown. The first pedigree of the draft horse was made in France. Heavy drafts were bred for artillery service for years. The heavier horses were used on the artillery service and bus service of the cities, while the lighter were used in the coach service of Paris and other cities.

Remember, young men, that the word thoroughbred is a name applied to the English race-horse and can only be used on the English race-horse.

If you are going to fix a type, we must inbreed to a certain line, to fix that type. This must be done very carefully and judiciously. Never cross-breed with wide variance.

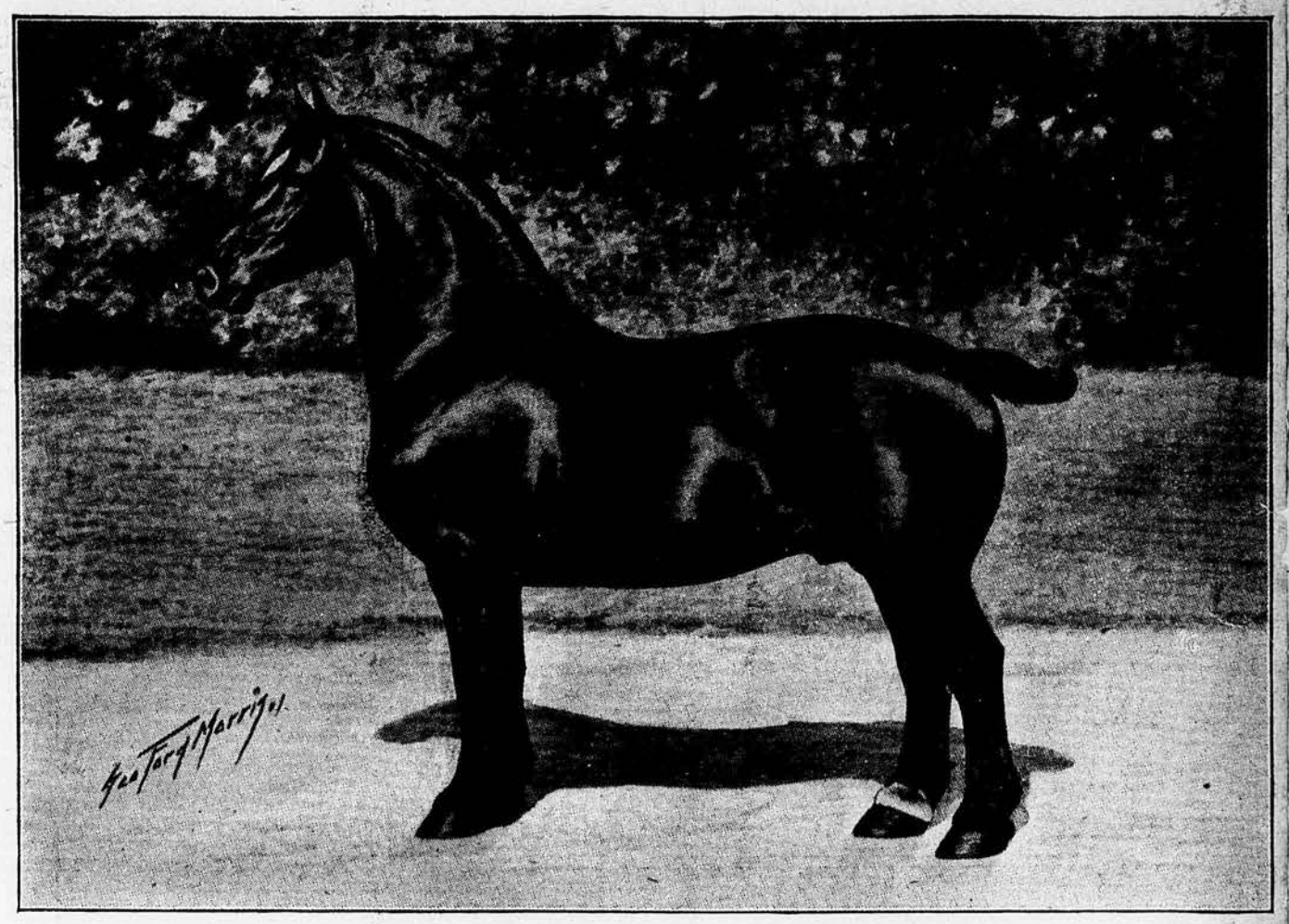
The first Percheron horses brought to this country were grey. Americans wanted a more solid color. By a splash of Belgian and judicious selection we have fixed a black color. In 1854 or 1855 six black Percherons were brought to this country. Louis Napoleon was one of these. He was brought to our part of the country, and we thought he was an elephant, his weight being 1,600 pounds. In the United States for draft purposes we are now breeding ton horses. The United States breeds the largest horses in the world to-day. There are a half dozen men in France who are breeding very large Percherons but they are for the United States markets.

The French government sets aside every horse if defective in wind or sight. No breeder can use a horse not registered and approved by the government inspector. France is the only nation that does this; but it has done France a great good.

Brain power is not easily distinguished, but its quality dominates the whole system and often the whole world. We want to increase brain power in an animal. Like produces like to a certain extent. In this way certain types become inherent, and we have a new breed for a specific purpose. This is illustrated in corn-breeding. Detasselling the imperfect, barren stalks leaves only the most perfect stalks with good sturdy tassels. The result is, we produce corn fertilized by the most perfect types. What is breeding? Select the ideal corn from stalk having the most perfect ear, reaching your own conception; save a peck or a bushel for your year's breeding patch; from this good, well-bred seed-corn you get the very best selection. This can be carried to every other plant that is self-fertilized. It illustrates to you that breeding must be done by skilled men.

You should have an ideal in your own brain. Draw a picture of the animal you want, like Mr. Bates; and like him, have the skill to breed to that ideal. It is most important that you should begin with the highest and best in God's creation.

You, with your opportunities, should make yourself better than your parents were. They had none of these great schools that you have. The first step is for you to get the proper type of a helpmeet. She must be brainy, healthy—a type of perfect woman. How often this is never thought of. It will decrease the percentage of feeble-minded and depraved, and if the same science be used in the human family that has now been used in the vegetable and lower-animal world, it will make a hardier race and a nobler stock, and render our Nation's future secure.



THE PERCHERON STALLION PICADOR 27370 (48373.)

Winner of second prize for stallion four years old and over at International Live-Stock Exposition, Chicago, December, 1901. Imported and owned by Dunham, Fletcher & Coleman, Oaklawn Farm, Wayne, Du Page County, Illinois.

Horse Week at the Agricultural College Stock-judging School.

EDITOR KANSAS FARMER:—Monday afternoon Professor Cottrell opened the work of the week in study of horses at 1:30 p. m., by the following introduction of the instructor for the week in the judging school:

"I am pleased to introduce to you, young gentlemen, Mr. J. W. Robison, of Eldorado, Kans. Mr. Robison has the largest farm in the State, with 2,000 acres in alfalfa, 2,000 acres in corn, several thousand acres in wheat, and other farm crops in equal proportion, while he has the largest herd of draft horses in the State, breeding from 200 to 250 full-blood and high-grade Percheron horses each year, besides a number of carriage and saddle horses.

"Mr. Robison has consented to leave his extensive business and spend the week in judging and directing us in the study of the horse."

Judge Robison had representative heavy drafts and trim trotters brought into the ring and gave a most instructive lecture on draft horses, showing the relative merits of various points in the score-card. Tuesday was given to the Percheron horses. A magnificent type of the Percheron stallion, one for which his owners paid $5,000 when 1 year old, was taken as the subject for the lecture.

"We now have a class that requires muscle and strength, but not speed. These horses have been bred in a place thirty by sixty miles square, in the heart of France, for the last 800 years. The nation's artillery horses are selected from this class.

"All horses, like all men and women, need to have good temperament. This horse has good brain power. We also see that he has the willingness, and his strong muscles show that he has the power to do. His eyes indicate clear intelligence, ears are alert. The horse stands up well with a model shoulder. Shape of leg below the knee is given by the sinews. There are more horses defective in the coupling than any other point above the knee."

In this way Judge Robison went over the horse from muzzle to tail, after which the students were asked to score six draft horses brought into the ring. The enthusiasm and interest Wednesday was great when six representative types of draft horses, both Percherons and Shires, were placed in the ring and Judge Robison said: "Young men, here are some good types of draft horses. Now you are a Kansas farmer, and I want you to select the team that you think will best meet Kansas conditions on the farm. You want a team heavy enough to do all your farm work, pull your heavy loads, and yet one that can take you to town or to church. Now select for me the team that you think will best meet these conditions."

The careful estimate and almost unanimous selection of one team showed how carefully the class had listened and profited by Mr. Robison's instructions.

Thursday draft stallions were judged. Some fine specimens weighing from 1,600 to 2,000 pounds were shown, and Judge Robison brought out the excellent points of each.

Pride of Linn, a 3-year-old Percheron at the head of Mr. John Warner's herd, Manhattan, Kans., was a beautiful black stallion. Next to him stood Dublin, at the head of the herd of H. Avery & Sons, Wakefield, Kans., a fine 4-year-old, imported in 1900 from the Percheron district of France. When 1 year old he cost his present owners $5,000. Though now a young horse he weighs 1,850 pounds and gives fair promise to yet make a ton horse. He was sired by the horse that took sweepstakes as a breeding stallion at the Chicago International and is half brother to Pour Quoi Pas, the winning Percheron at the Paris Exposition in 1900. The well-muscled "Nipple" was a fine type of Percheron owned by Mr. C. P. Dewey. His color, disposition, and well-muscled thighs made him a fine appearing horse for his class. The next was a solid, well-built Shire, lacking but seventy pounds of weighing a ton. It was imported from England and is owned at present by the Manhattan Transfer Company.

Judge Robison said to the class: "This breed originated in England. I have seen a Shire horse in the streets of Liverpool move a load of ten tons. These share honors as draft horses with the Perchreon.

"The last 100 pounds on a draft horse is worth 25 cents a pound when the first hundred is worth 10 cents per pound.

"A good draft horse in Chicago must have 1,800 pounds, to even be considered. Ton horses are there sought for, with all the muscle and strength that should go with it. The more style the better."

The class then were given a test in comparative judging, on a half dozen either pure-bred or high-grade stallions loaned the college for the day by neighboring breeders.

Friday, at 1 o'clock, a fine parade of pure-bred horses was reviewed by President Nichols and wife and the hundreds of assembled visitors. There were fine Percheron and Shire draft horses, French Coach roadsters, Hambletonian trotters, cob drivers and saddlers, with many special-type carriage, cart, and saddle horses. Over forty full-blood horses, each valued from several hundred dollars to several thousand dollars, made a magnificent "Horse Fair" that a Rosa Bonheur would have been proud to paint. Following the horses were many stylish rigs showing well-matched teams and fancy single drivers.

Headed by the college band, this procession passed in front of the college buildings, and halted in front of the steps to the president's office. Many competent judges pronounced this the greatest object-lesson in horses, by class, type and breed, ever shown in the State. At 1.30, the work in the judging school began with a lecture by Judge Robison on the French Coach Horse. A fine French Coach, belonging to Mr. A. W.

Turner, of Manhattan, was led into the ring. This was one of Judge Robison's best lectures and the judging room was tested to the fullest capacity by those who wanted to hear him. When he came to the tail he said:

"The French have a custom of docking the tail, while the English hack the sinews and cut the bone which is even worse. If nature had intended this horse to have a short tail she would have given him one. President Roosevelt, last fall, showed wisdom and good sense as well as kindness to all horses, when he refused to purchase a team of drivers with docked tails. His public condemnation of docked tails merits the approbation of all lovers of good and beautiful horses. When you get a perfect horse you don't need any one to point out his good points."

Some fine specimens of Hambletonian stallions were now brought into the ring, and Dr. Mayo gave a lecture on the essentials in a trotting horse. Dr. Mayo said:

"The greatest essentials are speed and ability to produce the speed in others. Other essentials are:

"1. Size.

"2. Style.—Finish should be neat and tidy. I like to see a horse run as though he owned the earth, although this is not necessary to speed.

"3. Form.

"4. Quality of bone, sinews, hair, and skin.—Fineness of the skin should be quite marked. The hair should be soft and silky and the coat fine, while tendons and veins should stand out well. The head should be broad between the eyes to indicate brain power.

"5. Nerve ability.—Shown in the countenance, action, and ability to do. The neck should have a clean whip-cordy feeling. The muscles should be fine.

"6. A prominent eye.

"7. Clean, fine, sinewy neck.—This is not only desirable but necessary.

"8. Quality of legs.—Well-muscled knees; clean, wide, and strongly supported. All joints should be strong.

"9. Not a large but a strong foot.—Above all other qualities a trotter must have good feet.

"10. Well-ribbed body.—If not, the horse will be 'slab sided' and lack stamina.

"11. Well-coupled back.

"12. Good, strong hind quarters.—This is the propelling power of the horse.

"13. Sound hocks.—They are the most essential features of the hind legs and should be carefully looked after."

The horse used as the obect-lesson for Dr. Mayo's lecture was Crombie, sired by Wheeling Wilkes. He made a time of 2.27¼ on a muddy track.

The students were asked to rank and score some young trotters that were led into the ring, after which Dr. Mayo and Mr. O. L. Thisler, of Chapman, ranked the trotters.

Cob horses were then explained to the students, and Mrs. Ida Brady entered the ring, leading her cob riding-horse. The essentials for a cob horse were shown to be a close, compact form, well muscled, good disposition and with a dainty, stylish movement. This horse is designed for lady's saddle horse and single rigs. The English sportsman generally rides a cob to the hunt.

A find line of carriage and coach horses, hitched to stylish rigs were next driven through the barn, followed by saddle horses with lady and gentleman drivers.

On Saturday the ring was filled with a miscellaneous assortment of horses, and in opening the work Judge Robison said:

"Young gentlemen, I want to test the value of your week's study of horses. You will find in this ring representatives of every class that we, this week have studied. I want each one of you to go down into the ring and select the best team of draft horses, the best all-round farm team, the best coach team, the best lady's driver and the very best saddler in that ring."

The result was shown when Judge Robison made his selections. The whole class had selected the first three types as the Judge ranged them.

Then a large class of fancy drivers and saddlers were led through and each one was classified and explained by Mr. H. G. Barnhouse and Dr. Mayo as it passed in review through the ring.

Mrs. Scott Higinbotham elicited much applause when she drove her driving horse in and went round and round the ring. It's style and action seemed well-nigh perfect and Judge Robison had Mrs. Higinbotham drive down to the center of the ring where he showed why this was a typical lady's horse.

"We need more horses bred in this class," said the Judge. "We have no ladies to spare, we don't want to have them maimed or killed. This is a gentle, good-dispositioned, well-finished horse. No superfluous flesh, action good. That horse needs no whipping."

Judge Robison, in closing the week's work, said:

"This closes our horse-judging. You have had a plain, old Kansas farmer for instructor, with little theoretical knowledge, but lots of experience. This latter is a very costly school to go to. You all will have horses to handle, no matter what you do or where you go. Remember, these horses have been grown and bred for a single purpose, and I caution you not to cross-breed them. Select your business then select your horse to suit your business. It has taken centuries to breed these horses up to their present high standard, but a few generations of either cross-breeding or careless handling can undo the work of these hundreds of years.

"Breeding purifies the blood. You and I belong to the Anglo-Saxon race, that by education and good breeding to-day dominates the world. May we keep our race pure Anglo-Saxon and the vitality, intellectual vigor, and dominant force shall permit us to rule the world.

"Young gentlemen, I thank you for the courtesies of this week's work with you."

This was followed with cheers for Judge Robison and for the judging school.

Professor Cottrell is to be congratulated on the almost phenomenal success of this first stock judging school in the State. Without funds, he has demonstrated the needs and utility of this practical school for studying the stock that is found on every well-regulated farm in the State.

The State, as well as the college, feels greatly indebted to Messrs. Rhodes, Gosling, Borman, Berry, and Robison, who, without compensation, left their private business at a sacrifice, and spent a week as judge in their respective fields of work, in the State Agricultural College stock judging school. W. H. OLIN.

Manhattan, Kans.

Mr. Robison's System of Farming.

Friday morning, Professor Cottrell, Professor Otis, and Professor Shoesmith merged as many of their classes in Agricultural Hall as it would hold, to gain practical lessons from the experienced and most successful horse-breeder and farmer, Mr. J. W. Robison, who this week instructs the students in horse-judging. In introducing Judge Robison and his subject, Professor Cottrell said:

"Last summer I spent an entire day riding over Mr. Robison's 17,000-acre farm. I have visited hundreds of farms, in Kansas, and the very best farms in the Eastern States, and from my observations Mr. Robison's plan is the best and most profitable system of farming that I have seen anywhere. I have therefore asked him to tell you boys what his plan of farming is and how he got his start."

The following is a synopsis of Mr. Robison's lecture:

The management of a farm, depending as it does largely upon climatic conditions, productiveness of the soil, and condition of the markets, after all depends most largely upon your own judgment.

At the professor's request, I will give you a little of my experience and tell you how I came to do as I am now doing.

My father lived in Illinois when I was a boy. He gave his boys the best start he could, but when I wanted to go to the academy he could not send me, as my younger brothers and sisters were then in school, and it took all the farm could raise to keep them in school and "the wolf away from our door." I then proposed to father that he give me a piece of land to farm and I would clothe and educate myself.

It was then agreed that I was to have the use of team and tools, and father was to give me a thirty-acre field to farm. The team was composed of one horse that had "poll evil," while the other one had a bad case of fistula. The latter was so bad that I had to make a breast collar out of an old piece of breeching and having no bridle made a rope bridle out of an old halter.

The field was an old stumpy one, but I found it to have a soil rich with leaf-mold. I was then 17 years old. The first year I raised corn. When the corn failed to come, but on each side of each stump I put in pumpkins, watermelons, tomatoes, and other garden vegetables.

I raised enough from that first year's crop to pay my expenses for the entire year and let me go to school during the winter months. I walked four miles to school all that winter.

The next year I bought a mare with one eye, because I could get her for $45—a blooded horse of 1,000 or 1,200 pounds. I valued that horse as much as any horse I ever owned. I felt sad every time I looked into that dark eye, for it was knocked out, was not a natural blemish. I bought another mare, unbroken, and I had a team. I raised a pair of colts from those mares that sold for $800. One of those mares has raised $32,000 worth of colts—their owner told me some years ago.

I now rented some more ground, and for two years raised vegetables and corn, going to school in Peoria four months each winter. While I did not get much money, I did get a whole lot of business experience. I would, in apple season get up early in the morning, take a load of apples to market, peddling them for three to four times what I paid for them, always remembering to be strictly honest.

The best friends of my life I made while selling apples. One man afterwards gave me a job that brought me in $10 a day. Young men, it always pays to be honest in all you do, and to always live up to your word.

I made from two to three trips to market each week, bringing from $10 to $12 returns for each load sold. People all over this world are prone to do what they are solicited to do in banking business, life insurance business, and all other pursuits. When just passing out of my teens I went to Illinois College. I there sat at the table made by Stephen A. Douglas when he was there in school.

I took $100 to pay my expenses, but found that this would not meet all expenses. "Necessity is the mother of invention," and, I will add, of Ingenuity, his twin brother, too. I had taken a course in monochromatic drawing. While I was not an artist, yet I did have some very attractive designs, and as the college boys admired my drawings, I told some of them that I would teach them to make just as good pictures as mine for $5. I got another $100 in this way. They were shown to the ladies of the Presbyterian church. I was invited to form a class among the ladies who desired to take lessons. I need not tell you that "Mr. Robison, the artist," was now very much embarrassed; but I had $100 more money when I went home than when I came to college.

When I got back from college, a gentleman, whose two sons wanted to go to California, induced me to go in with them, purchase 800 steers, and take them through.

Three-year-old steers then cost but $8 apiece. I received a letter from my son this morning stating that he had sold 300 head for $47.50 per head. That shows the difference between then and now. I had but $300 to put into this cattle venture, but my good friend said he would advance for me, and I was to go to California with the two neighbor boys to make my fortune. When I came to bid my mother good-bye, her words of entreaty, her deep grief at parting, and earnest tears, led me to grant the one promise that she urged—that I would not go, for "Jim," she said, "as sure as you go you will be killed by the Indians." So I sought release from my friends and the boys went West without me. One died of fever, the other was shot by the Indians, and the cattle were "scattered to the four winds."

I now bought a farm near father and mother, promising to pay $2,000 for it, in four $500 annual payments. The place was thoroughly seeded down to cockle-burs. I put in my corn, but found the cockle-burs made a much thicker stand than my corn. I got a hand to help me and we "went after" the burs. I made my beets, potatoes, apples, etc., each year pay that annual payment without touching the corn. I planted an apple-orchard of eighty acres, for I had found there was money in apples. This was now in the days of wild-cat banks. A man found his money worth full value one day and not worth 3 cents the next day. In those days we used to ride ten miles after night to pay a bill or a debt for fear the money would not pay the debt if kept over night.

I will not stop to tell you how the man and his wife, who had taken care of my home, left me and I was led to get a housekeeper all my own, or why I chose the very best and prettiest girl in all that region for that one, who has all my life proven so worthy a helpmeet, for I want to tell you why I farm as I do and where I do.

My growing family of boys told me I must get some more agricultural land. Land in Illinois had risen from $16 to $100 an acre since the days of my teens, and I felt I must go elsewhere. I traveled all through Dakota, Nebraska, and as far south as Louisiana, seeking the best place to locate. After traveling thousands of miles I decided to locate in Butler County in your State. In the States north of you they had beautiful land, but farmers had to raise spring-wheat, and had long and often severe winters. In Butler County, I found I could raise winter-wheat and could feed cattle in a better climate, making each bushel of grain a little more beef. Could also here raise good spring crops.

The first summer here I broke up 1,000 acres of prairie land and in the fall sowed it to wheat. I paid $6.25 an acre for the land, and the next year I sold that first wheat crop on the farm at $1 per bushel, bringing sufficient returns to pay for first cost of the land; all expense of sowing, reaping, and threshing the grain; and a "little nest egg" besides.

My Butler County farms being scattered, and not satisfied with the "hired man plan," that I was used to, I decided to put up good comfortable houses and barns on each farm, plant a good orchard, give a good garden patch, and with these all furnished free, try to get farmers who would take a pride and interest in the farm. On account of difference in seasons, I decided to myself take the risk of the season and pay for each farm operation as soon as it was satisfactorily completed. I so stipulated the price I would pay in my farm contracts, each one containing a provisional clause stating that if the farmer failed to do the work at the proper season and in a proper manner the contract could be terminated at my pleasure.

I have rarely had to cancel any of these contracts and many farmers have been with me eighteen years. Each farmer furnishes all teams, tools, etc., necessary to do the farm-work.

Here are the rates I usually pay for the cropping of corn. I usually list about three-fourths of my corn and check-row the rest. So I will indicate the operations for each. The cutting of weeds is at the option of the farmer. He finds it pays not to let weeds grow up and seed the ground.

COST PER ACRE IF STALKS ARE STANDING.

Getting off stalks	$ .25
*If high stubs	.10
Listing	.30
Warner's scratcher	.15
Harrowing	.10
Cultivating three times	.75
Weed-cutting (optional)	.10
Total	$1.40 to $1.65

*If stubs are low I do not remove them.

I have raised eighty bushels of corn to the acre at even a less cost than that. A neighbor of mine, seeing how I made

SHEEP.

FOR SALE—Thirty full-blood Shropshire ewes and lambs. J. L. Bass, Route 4, Ottawa Kans.

FOR SALE—Plain Merino ewes, 150 head; Merino rams, 45 head; at low figures for quick sale. L. C. Walbridge, Russell, Kans.

AGENTS.

WANTED—A good, active man with horse and wagon, to repreesent us in each county. Will bear investigation. Imperial Stock Food Co., 902 Jackson St., Omaha, Neb.

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MISCELLANEOUS.

BUSH'S GAS RELEASING BITS have given satisfaction wherever used. See ad.elsewhere in this paper.

WANTED—A Mastiff puppy. V. C. Lambert, Hiawatha, Kans.

FOR SALE—Page Woven Wire fencing. O. P. Updegraff, General Agent, Topeka Kans.

WHY WAIT until the middle of May to put your cattle on pasture, your alfalfa is usually large enough by April 1. Bush's Gas Releasing Bits prevent Bloat. See add elsewhere in this paper.

THE BEST CUP OF COFFEE and plenty of good things to eat. Farmers' trade a specialty. Come and get something good. The Two Minute Restaurant, 532 Kansas Ave., Topeka, Kans.

FOR SALE—Two pedigreed Scotch Collie pups 7 months old; both females. Address, Hill Top Farm, Parkville, Mo.

FOR SALE—Feed mills and scales. We have 2 No.1 Blue Valley mills, one 600-pound platform scale, one family scale, and 15 Clover Leaf house scales, which we wish to close out cheap. Call on P. W. Griggs & Co., 208 West Sixth Street, Topeka, Kans.

VISITORS TO TOPEKA—Rooms for rent for transients, northwest corner 12th and Polk Streets, Topeka, Kans. Meals served. Mrs. E. Porter.

WOOL WANTED—We have just completed our New Woolen Mill in North Topeka and want at once 200,000 pounds of wool for which we will pay the market price. Write us if you have wool for sale. Western Woolen Mill Co., North Topeka, Kans.

BALMOLINE—Nature's Wonderful Healing Salve. Man or Beast. Druggists, 25 and 50 cents. Trial size 4 cents from B. H. DeHuy, Ph. D., Abilene, Kans.

STALLIONS FOR SALE

Percheron, Belgian, Shire, coach and standard bred stallions for sale at prices you can afford to pay. H. C. Thompson, Peabody, Kans., on Santa Fe and Rock Island roads.

The Stray List.

Week Ending March 13.

Montgomery County—D. S. James, Clerk.

MULE—Taken up by Stephen Stilley, in Parker tp., (P. O. Coffeyville), February 12, 1902, one large, blue mare mule, 16 years old.

Week Ending March 20.

Ford County—S. P. Reynolds, Clerk.

BULL—Taken up by Samuel Burrell, in Concord tp., (P. O. Dodge City), October 10, 1901, one pale red bull, horns sawed off, branded H on right hip.

Sedgwick County—J. M. Chain, Clerk.

BULL—Taken up by H. J. Nagel, in Minneha tp. March 3, 1902, one red bull, 1 year old; valued at $12.

Plants, Bulbs, and Evergreens

Raspberry and Blackberry, 70c per 100; Strawberry, 60c per 100; Raspberry and Strawberry, 2c each; Asparagus, 50c per 100; Rhubarb, 35c per 12; Evergreens, Norway Spruce, Scotch Pine, Arbor Vitæ—2 feet to 2½ feet, 25c each; Bulbs, Gladiolus, and Tuberoses, 3c each; Cannas and Dahlias, 5c each; Greenhouse Plants, 2 to 5c.

H. H. KERN, Bonner Springs, Kans.

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Road Wagons, $24.25; Top Buggies, $30.25; Harness, $4.80; Saddles, $2.65; Farm Wagons, $55.00.

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Four Yards—15 Acres. Exclusively taken by the largest and best flock of Buff Plymouth Rocks in Kansas. Eggs sold from two best yards only, at $2 for 15.

Prize-winning M. Bronze Turkey Eggs, $2 for 11.

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United States Military and Bounty Land Warrants Wanted.

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Right Price. Right Price is Made

Farms should be sold. They must be sold right. Also advertised right. A small profit. To make right prices—buy right, sell right, don't waste time and money. Our prices are net. See or address

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Wellington is the popular Denver Stock. Why? Because we have the best location in the oil district and are selling our stock at a price that commends itself to the careful investor. Compare the price, 3½ cents, with other first-class properties. Stocks adjoining us have advanced from 5 cents to 15 and 25 cents. If you wish a higher-priced stock wait thirty days and pay 10 cents for Wellington. It is the best on the market. No leasing. No royalties. No restrictions. No salaries. Non-assessable. Non-forfeitable. Depository: Colorado National Bank. To secure this stock at 3½ cents telegraph or send check with order.

THE WELLINGTON OIL & GAS CO.,
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GAS RELEASING BIT

FOR PREVENTING BLOAT IN DAIRY COWS AND

other stock while feeding on alfalfa & clover. Every farmer will save money by using this bit. Can be used early and late and in mid-season when other pastures are short and barren. This bit is strongly made and durable. A complete success. By mail to any address. Reliable Agts. Wanted.

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the entire corn plant. How to build, how to fill and what to fill with. Write at once to

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have run right into PAGE FENCE and not hurt driver, team nor fence. It's like a cushion.

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Bought at Receivers' Sale. Sheets either flat, corrugated or "V" crimped. No tools except a hatchet or hammer is needed to lay the roofing. We furnish free with each order enough paint to cover and nails to lay. **Price per square, $1.75** A square means 100 square ft. Write for Free Catalogue No. 61 on General Merchandise. **Chicago House Wrecking Co.,** West 35th and Iron Sts., Chicago, Ill.

Well Drills FOR Water Oil Gas Coal

Successful drillers use them! Write us stating your wants fully. Give diameter and depth of wells, and tell what kind of power is wanted.

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The Middleman's MONEY Makes the Fence No Better.

Then why pay him a lot of extra money? Why not save that amount by buying from us direct at wholesale prices? We do not impair the quality to make our fence cheap. In fact, we depend upon the quality to hold our trade. We couldn't sell the

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Spring and Spike Tooth Harrows, Rollers, and Handcarts.

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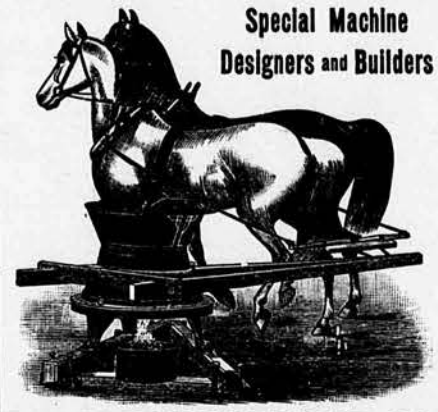

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Can do more work in a day than 5 men with HOES. All made of steel. Propelling force goes direct to wheel. Tempered steel springs, automatic adjustment.

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PUMPS WATER—
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STEM-WIND WATCH, CHAIN AND CHARM

You can get a **Stem-Wind,** Nickel-Plated Watch, warranted, also a Chain and Charm for selling 19 packages of Bluine at 10c each. Send name and address at once and we will forward you the Bluine and our large Premium List, postpaid. No money required.

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Columbian Beauty Seed Corn, the premium corn of the world. It took the premium at the World's Fair. The corn is snow white, large grain and small cob, weighs 60 POUNDS TO THE BUSHEL, 3 TO 5 EARS TO THE STALK; grows from 250 TO 300 BUSHELS TO THE ACRE. It is worth its weight in gold. The seed from which this corn was grown was brought here from Genoa, Italy, in 1890, by Col. Geo. Siewers. The price of this valuable corn is, by mail, postage paid, HALF POUND 30c, ONE POUND, 50c, THREE POUNDS $1, ONE PECK $2.50, HALF BUSHEL $4, ONE BUSHEL $7, TWO BUSHELS $12. Every package guaranteed to give satisfaction or money cheerfully refunded at once. I refer you to S. E. Stewart, postmaster at this place, or to any reliable merchant. Order to-day and be ready to plant when the season comes. The best is always the cheapest. For a success,

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Registered Stock, **DUROC-JERSEYS,** contains breeders of the leading strains.

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DUROC-JERSEYS.

100 head for this year's trade; all eligible to record.

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FAIRVIEW HERD DUROC-JERSEYS

Has a few September and October pigs at private sale. Everything not sold May 15 will be held for fall sale.
J. B. DAVIS, FAIRVIEW, BROWN CO., KANS.

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Stock for sale at all times.
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Special drive on 10 spring boars, weighing from 180 to 225 pounds, at prices to move them; they are large, lusty fellows, 3 of them good enough to head any pedigreed herd; also 20 choice gilts that I will breed to Star Perfection, by L's Perfection, Black Perfection—grandson of Missouri's Black Chief and L's Perfection, and Corwin's Improver. 100 head in herd. Write for anything you want in Poland-China hogs. **John Bollin,** KICKAPOO CITY, KAS. (Express Office, Leavenworth.)

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The Great Missie Bull, Imp. Mariner 135024,

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POLAND-CHINA SWINE, SHIRE and PERCHERON HORSES, and POLLED DURHAM CATTLE.

Stallions of both popular Draft breeds for sale; also two jacks.

☞ Attention is called to the Public Sale of Poland-Chinas on March 21, 1902, at Winfield, Kans., by Snyder Bros. and H. E. Lunt.

PERCHERONS.

J. W. & J. C. ROBISON, Importers and Breeders,
TOWANDA, BUTLER COUNTY, KANSAS.

Largest herd in the State. Imported, and American bred stallions and mares for sale at all times. Prices reasonable. Inspection invited.

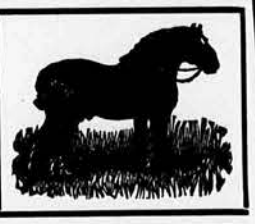
RIVERSIDE STOCK FARM.

O. L. THISLER, Chapman, Dickinson Co., Kans.,
IMPORTER AND BREEDER OF
Percheron Horses and Shorthorn Cattle.

FOR SALE—Percheron Stallions and a few Mares, about 20 head of Shorthorn Females, and a few fine, young Bulls. Also several fine, large Jacks. Pedigrees and breeding of all stock guaranteed.

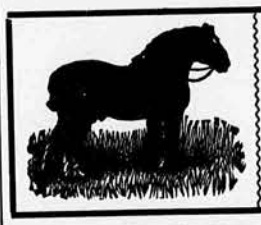
WE ARE NOT THE LARGEST IMPORTERS

In the United States, neither have we all ton horses. But we do make five importations each year. Our stables at Lincoln, Neb., and at South Omaha Union Stock Yards are full of first-class Percheron and Shire stallions. If you want a good one for what he is worth, it will pay you to see us. Our horses won sweepstakes in all draft and hackney classes at Nebraska State Fair. Address all correspondence to



WATSON, WOODS BROS. & CO., Lincoln, Neb.

SPECIAL NOTICE: Woods Bros., of Lincoln, Neb., have two cars of Shorthorn and Hereford bulls and cows at a bargain.



Percheron Stallions.

70 First Class Young Percheron Stallions

Now in our Shenandoah stables. Our last importation arrived October 1, 1901—mostly black, 3-year-olds, 30 imported stallions. An elegant string of 25 big two's and three's of my own breeding. Thirty years in the business. Come and see the horses.

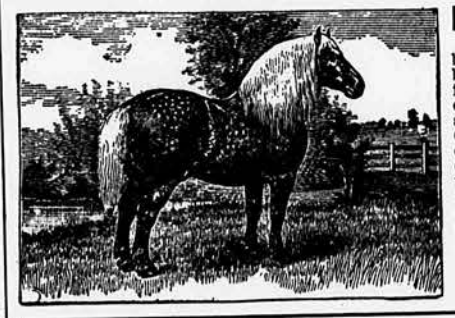
M. L. AYRES, Shenandoah, Iowa

German Coach, Percheron, and Belgium Horses.

OLTMANNS BROS., Importers and Breeders, WATSEKA, ILLINOIS.

Three Importations in 1901. ***100 Stallions For Sale.***

No other firm enjoys such buying facilities; the senior member being a resident of Germany is personally acquainted with the best breeders in France, Germany, and Belgium. We can save you money. Come and see us. We shall exhibit at the International Live Stock Exposition, Chicago, Dec. 1-7, 1901.



ROYAL BELGIANS, PERCHERONS

Our importation of July 10 are in good condition for breeding. We don,t stuff or pamper our horses to deceive buyers; a pampered horse don't get colts until reduced in flesh. These horses are all large size and the best quality of breeding. Their ages run from 2 to 5 years, and their weight in driving flesh from 1,800 to 2,200 lbs. Colors are blue and strawberry roans, blacks, bays, and dapple greys. For quality and bone they cannot be duplicated in Illinois or Iowa. They measure now in solid bone from 13 to 14 inches. I sell horses on the smallest profit, and the best guarantee, and give best bargains and terms; sell on time on good paper. It will pay parties in need of a breeding stallion to come to Pontiac and see this lot of horses. Pontiac is on the C. & A., Ill. Cent., and Wabash Railroads, 92 miles south of Chicago; 65 miles east of Peoria, and 50 miles west of Kankakee.

NICKOLAS MASSION, IMPORTER, PONTIAC, ILLINOIS.

America's Leading Horse Importers

We import not only far the greatest number of stallions from France, but far the best ones.

We import more prize-winning stallions than all others combined at the three greatest shows of France, at Nogent-le-Rotrou, Nantes, and Mortagne.

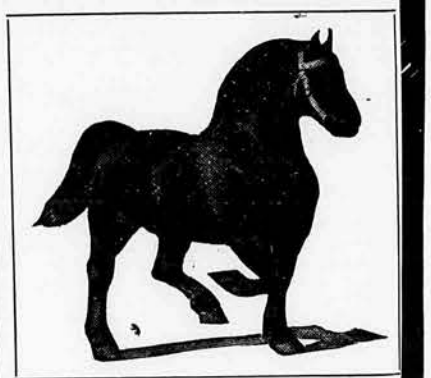
Our Percherons won every first prize including grand championship over all draft breeds at the great Pan-American Exposition.

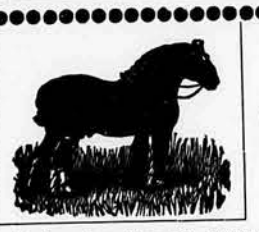
Our success at the Iowa State Fair and Ohio Exposition was equally as good.

Our French Coach Stallions did not sustain one defeat at any one of these great shows.

The best horses and just and honorable treatment of customers have given us the lead.

McLAUGHLIN BROS., COLUMBUS, OHIO.
BRANCHES: EMMETSBURG, IOWA; LAWRENCE, KANS.





When We Talk We Tell the Truth

and no one dare DISPUTE it.

We Import nothing but HIGH-CLASS Stallions; no cheap or old stuff, no job lots or so-called bargains.

We bring our stallions to this country early in the sea[son] giving ample time to acclimate them. No concern in the United States has [bet]ter facilities in the way of barns, stalls, hallways, etc., to reinstate their n[at]ural condition. We have a large number of coal black Percherons, 2-, 3-, and 4-year-olds; also a number of the best Shire stallions in America, which we are offering at very close prices. Come and see us or wrrite us at once.

Long Distance Phone—575. THE LINCOLN IMPORTING HORSE CO., 33 & Holdrege, Lincoln, Neb

DRAFT STALLIONS

Percherons, Shires, and Clydes

We have a selection that are sure to suit you. As grand a lot [of] young stallions, of serviceable age as can be found in the country. W[e] do not claim to have every color or kind of a stallion, you or anybo[dy] may want, but what we claim you will find true if you pay us a vis[it]. All of our selections are made by a member of our firm, who has be[en] at this line of work the past decade and has absolutely a first cho[ice] from the leading breeders of Furope. Our last importation, consist[ing] of the three great breeds, and 62 head in numbers were selected in [the] early part of February, before any of the shows and to-day are rea[dy] for sale. Write us, or come and see us, if you or your community [are] in need of the best to be found.

KEISER BROS., Keota, Keokuk County, Iowa

APRIL COMBINATION SALE OF

HEREFORDS.

150 head of well-bred, registered Herefords of desirable ages, to be sold at PUBLIC AUCTION at

KANSAS CITY, MO., APRIL 8 AND 9, 1902.

A SALE THAT SHOULD INTEREST EVERY BUYER.

The cattle are contributed by C. G. Comstock & Son, Albany, Mo.; Benton Gabbert & Son, Dearborn, Mo.; Gudgell & Simpson, Independence, Mo.; Scott & March, Belton, Mo.; C. A. Stannard, Emporia, Kans.; and 20 other representative Hereford breeders.

Catalogue sent upon request by

GUDGELL & SIMPSON, INDEPENDENCE, MO

APRIL 14, AT CHICAGO,

George Bothwell Will Sell

SHOW YARD SHORTHORNS

And An Equally High-class Lot of BREEDING CATTLE.

This offering includes my entire victorious young show herd of 1901, to which are added a select draft of imported and home-bred Scotch females and an unsurpassed lot of young bulls and females the get of my famous stock bulls,

IMP. NONPAREIL VICTOR AND GRAND VICTOR.

In making this draft from the Clover Blossom Herd I have aimed to give the public a chance to buy the best lot of young show cattle that was probably ever before offered from any one herd, at one time and one man's breeding in this country. I am making no reserve of any of these show cattle and in order to further sustain the reputation of the Clover Blossom breeding herd I have listed an even divide of some of my best breeding cattle and the tops of all my young things. I will submit these for public appraisal with the full confidence that both the breeding and individual merit will fully measure up to the demands of those seeking the very best class of cattle for both show yard and breeding purposes.

I extend a cordial invitation to all interested in high-class breeding and show cattle to attend this sale.

For Complete Illustrated and Descriptive Catalogue, address GEORGE BOTHWELL, Nettleton, Mo.

Angora Goats

...AT...

Public Sale.

ON MONDAY, MARCH 31, 1902, AT KANSAS CITY, MO.,

I will sell at PUBLIC AUCTION, 1,500 head of High-class and recorded Does in Sheep Division No. 2, Kansas City Stock Yards. These does are exceptionally fine and due to kid the first half of May. They are all carrying twelve months' fleece. Will also sell 500 wethers for brush cleaning purposes. Parties wishing to purchase Angora Goats, will do well to attend this sale. Sale begins promptly at 10 a. m.

W. T. McINTIRE, Agent,
221 LIVE STOCK EXCHANGE,
KANSAS CITY, MO.

Two Years Ago

You were advised IF A RENTER, a Farmer's son unable, owing to high values of land, to secure a farm near your old home; or a farmer burdened with taxation, heavy mortgages, impoverished soil or failure of crops, to

Secure a 160 Acre Homestead

In MANITOBA, ASSINIBOIA, SASKATCHEWAN OR ALBERTA, the GRAIN and GRAZING DISTRICTS of FERTILE WESTERN CANADA.

The experience of those who acted upon the advice is so gratifying that the advice is now repeated, and the offer of a free farm to every male over eighteen years of age and every female head of a family is made.

Railways, Markets, Schools, Churches, etc., convenient. Climate healthiest in the world, soil the best. Write for railroad rates, maps, pamphlets, letters from settlers, etc., to Superintendent of Immigration, Ottawa, Canada, or to the Canadian Government Agent

J. S. CRAWFORD,
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Liebig's Lump Jaw Cure

is a liquid and is applied externally. Quickly penetrates through the local tissues and blood vessels, reaching and killing the germs of the disease. When the germs are destroyed the tumor is dead and nature quickly throws it off. It is a powerful antiseptic and disinfectant. Animals cured with it pass the most rigid inspection. **Every bottle sold under a positive guarantee.** Regular price, $3 per bottle. **Our special price, $1.75 prepaid.** Ours is the only **Wholesale Drug House** selling direct to consumers at wholesale jobbing prices. Quotations cheerfully given. **Agents wanted.** Write for free illustrated, "Live Stock, Poultry and Veterinary Book."

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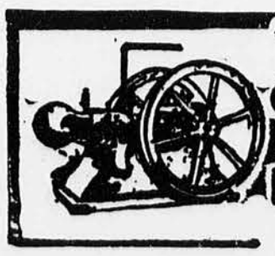

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