

are too strong against you. Combination horses (harness and saddle) are the most profitable, but are harder to produce than the common livery or road horses. They must show quality and good breeding to catch the eye of the prospective purchaser. Good sound coach or trotting-bred mares, with inclination to bend the knees well, picking the hind legs up quickly, and going perfectly square, mated with Thoroughbred horses, or half or Thoroughbred mares mated with Hackneys, are the usual methods adopted in producing combination horses. If properly cared for, they bring high prices, either green or broken. We let the colts have the same care as the heavy ones till the spring they are three years old. Then they are tied in the stalls with the older horses, and driven every day to get them perfectly quiet in harness. Increase the feed as the colt becomes more broken, and give a daily lesson on the halter. He is then ready for the dealer or showman any time. There are plenty of buyers for this class from three to four years old, of good quality, and handled this way, prices ranging from \$175 to \$300.

In breaking road colts intended for long drives, they should be broken in the fall of the year, off the grass, when they can stand long trips right at first, as they will never be good all-day road horses if used much to short drives. If possible, take him where there are electric cars and automobiles in his first lessons, as he will pay less attention to them than when partly broken.

Following is the record of a half-bred mare (got by Kentucky, a Thoroughbred, and a trotting-bred dam), used three years for driving and seventeen years for breeding purposes. Result: Fifteen colts; one died from castration at one year old; two, the oldest and the youngest, are still on the farm, breeding. The remaining twelve were sold between three and four years old at an average price of \$187.75, with very little handling. The mare was worked only the two years she did not breed. Total amount of sales, \$2,253, which I think you will agree with me leaves a good profit for feed and trouble.

We generally keep four heavy and two light brood mares on the farm, some years more, and have always made good profits by breeding horses.

H. S. FALLOWS.

Middlesex Co., Ont.

LIVE STOCK.

Muslin Curtain Ventilation Experiments at O. A. C.

Editor "The Farmer's Advocate":

In compliance with your request for a synopsis of the results of our tests of the muslin-curtain system of ventilation, I would say that it was our original intention to have this investigation carried on by a member of the staff of the Department of Physics, but it was seen in advance to entail a vast amount of labor at a time when the Department was already taxed beyond its limit

with teaching duties, hence it was turned over to Messrs. H. Sirett and H. C. Duff for thesis work, under the close supervision of the Department of Physics.

It was intended to start on the first of January, 1908, but it was found that the Christmas holidays, although occupied largely in preparation, were not sufficiently long to have everything ready. Besides getting the curtains in readiness, these men made a careful study of gas analysis, both theoretically and practically, in so far as carbon dioxide is concerned, so that it was the end of January before actual observations were begun.

The cattle stable in the main barn was ventilated by a modification of the Massey system. The fresh air, caught by cowls on the peak, was brought down through flues, a portion being discharged into the passage in front of each stall. The foul air was supposed to be drawn off at the ceiling through flues leading up to the body of the barn. In these outlets the air movement was always sluggish, so much so that part of the inlets were usually acting as outlets. This suggests that outlets should always be carried above the roof.

The dairy stable was, and still is, ventilated by the King system. The fresh air is taken through the wall at the floor and passes up through flues to the ceiling, where it is discharged into the stable. Being cold, and therefore heavy, it sinks, distributing to all parts as it does so. The outlets are so made that the foul air may be drawn from the ceiling in mild weather when the stable is likely to become too warm, and from the floor in severe weather. Since the ceiling air is always from 3 to 5 degrees warmer than that at the floor, this is a valuable control on the temperature of the stable.

The main stable had 12 windows on the south-east side, all of which were fitted with cheapest cotton (muslin curtain). It contained 45 head of cattle of all ages, with 1,550 cubic feet of space to each. The dairy stable had 14 windows, 10 of which were on the north-west, two on the south-east, and one on each of the other sides. Of these, seven were fitted with muslin curtain, four on the north-west, two on the south-east and one on the north-east. The stable held 38 head of cattle, all grown, with 1,024 cubic feet of space to each.

In each stable the readings were taken for twenty-five nights, beginning from 9 to 10 p.m., and concluding from 11 to 12, sometimes later. The regulation systems, King and Massey, were tested, then the muslin curtain, then the King and Massey, and then the muslin curtain, each test continuing approximately one week. Observations were begun the last of January, and were continued till the third week in March, a few days thus elapsing between the various tests. The regulation systems were not adjusted by the experimenters, but were tested as in use by the herds-men at the different stables.

The first question arising was, of course, how to compare the air in the stables under the various systems. Since the purity or impurity of air vitiated by breathing is usually stated in terms of the carbon dioxide content, we decided to use that

as one point of comparison. Besides this, the following data were taken: Maximum and minimum temperatures for the night, both outside and in the stables; temperature at floor and ceiling at time of observation; humidity at floor and ceiling.

Table I shows the averages in the main stable where Mr. Sirett was in charge. Table II. shows Mr. Duff's averages in the dairy stable. A study of these tables will reveal the following facts:

(1) In the King and Massey systems the carbon dioxide was invariably greater at the ceiling than at the floor.

(2) Out of four tests of the muslin-curtain system, two showed the same amounts of carbon dioxide at the floor and ceiling, one more at the floor than at the ceiling, and one vice versa.

(3) The average carbon dioxide content at the floor in the main stable by the Massey system was 9 parts by volume in 10,000 volumes of air, and by the muslin curtain, 12.4, an increase of 37.7%. The floor readings were taken at the average height of the cattle's nostrils, and so far as being a test of ventilation is concerned, they are more valuable than the ceiling readings. The latter are valuable largely from a scientific standpoint, as showing by comparison with the former the distribution of carbon dioxide in the stable under the various systems.

(4) The last test of the muslin-curtain system in the main stable showed less carbon dioxide than the first test of the Massey system. This would probably be explained if we knew the wind velocities for the first two tests. Our anemometer (wind measurer) was not installed till February 14th.

(5) In the dairy stable the muslin curtain showed in all cases more carbon dioxide at the floor than the King system did, the averages being 12.7 for the King and 18.5 for the muslin curtain, an increase of 43.4%.

(6) In the main stable the humidity (moisture) was considerably greater at the floor than at the ceiling, by both systems.

(7) In the dairy stable the King system showed a little more moisture at the ceiling, the muslin curtain about the same all over.

(8) The muslin curtain caused a considerable increase of moisture in the main stable and a slight increase in the dairy.

(9) The humidity in the main stable was very much higher than in the dairy stable.

(10) The carbon dioxide was less in the main stable than in the dairy stable.

In connection with (10), it is worth remembering that each animal in the main stable, both young and old, had 50% more space than those in the dairy, all of which were adult; hence, other things being equal, we might expect more carbon dioxide in the dairy than in the main stable. Applying the same reasoning, we would say that there would be less moisture in the dairy. But the opposite is the case, as per (9). This excess moisture must be accounted for by some unequal condition—and here we remember that the main stable is a stone basement, the dairy is a frame.

(11) From the average temperatures we can tell little, but the individual readings show a greater fluctuation with the muslin-curtain than

TABLE I.—MAIN STABLE.
Massey System vs. Muslin-curtain System.

SYSTEM.	Date, 1908.	Wind. Velocity Miles per Hour.	Temperature.		Humidity.		Carbon Dioxide.		Adjustments.		
			For Night.		At time of Reading.		Volumes in 10,000 Volumes of Air.		Massey. Muslin Curtain.		
			Outside.		Inside.		Floor.		4 at 4 at 6 windows		
			Max.	Min.	Max.	Min.	Out- side.	Floor.	4 at ceiling.	4 at floor.	44x26 inches on S. E.
Massey (1)—Jan. 30 to Feb. 6.....			18.3	4.4			9.3	34.6	84.9		
Muslin Curtain (1)—Feb. 13 to Feb. 18...			24.6	20.4			24.4	45.7	88.8		open
Massey (2)—Mar. 5 to Mar. 14.....		16	36.7	30.3	49.3	44.7	45.5	50.4	86.1	82.6	open
Muslin Curtain (2)—Mar. 16 to Mar. 23.		9.3	32.3	26.5	51.3	47.0	48.8	52.4	89.4	84.6	open
Massey—Averages			36.7	30.3	49.3	44.7	45.5	50.4	86.1	82.6	↑
Muslin Curtain—Averages			32.3	26.5	51.3	47.0	48.8	52.4	89.4	84.6	12 windows all [on S. E.]

*In case of related readings the averages include only the observations when both readings of the pair were taken.

†Remarks—Half of inlets acting as outlets.

TABLE II.—DAIRY STABLE.
King System vs. Muslin-curtain System.

SYSTEM.	Date, 1908.	Wind. Velocity Miles per Hour.	Temperature.		Humidity.		Carbon Dioxide.		Adjustments.		
			For Night.		At time of Reading.		Volumes in 10,000 Volumes of Air.		King. Muslin Curtain.		
			Outside.		Inside.		Floor.		Outlets. Inlets. Curtained win-		
			Max.	Min.	Max.	Min.	Out- side.	Floor.	5. ing 8. ing 8. N. W. N. E. S. E.	Floor.	does in use.
King (1)—Feb. 3 to Feb. 8.....			17.3	—2.	54.8	49.7	3.4	49.0	51.8	76.3	77.5
Muslin Curtain (1)—Feb. 10 to Feb. 17.			26.0	21.6	59.6	52.2	25.5	53.6	57.0	77.9	79.2
King (2)—Mar. 3 to Mar. 7.....		19.5	32.3	28.5	58.8	54.3	28.3	57.8	62.0	73.3	75.1
Muslin Curtain (2)—Mar. 9 to Mar. 14.		8	36.2	28.4	60.9	53.8	29.6	56.2	60.8	72.4	71.3
King—Averages			24.8	10.7	56.5	51.6	15.1	52.4	55.7	74.8	76.3
Muslin Curtain—Averages			30.6	24.7	60.2	52.9	27.4	54.8	58.7	75.1	75.6

*One partially open.

†2½ open.