

COMFORT AS A FACTOR IN STOCK RAISING.

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PREFACE.

To be successful in this day and age of specialists attention must be paid to the smallest and most insignificant details of any profession or line of work pursued by man. It is these seemingly little, unimportant things that are the cause of so many failures and small profits. They may be the last straw and if neglected cause disastrous results. The old adage, "Save your pennies and the dollars will care for themselves," applies to many things other than finances. In the industry of stock-raising this tendency to neglect little matters is perhaps as notorious or more so than in any other line of business. The average farmer supplies the absolutely necessary requirements that are demanded by stock, such as food and a place of confinement, regardless of its quality benefits or condition. The animals likes or dislikes are not taken into consideration, nor is the convenience, comfort, and health of conditions furnished, regarded from the animal's standpoint.

To raise stock with maximum success a farmer must take into consideration all the factors that influence the growth and development of his cattle. He must sort out and eliminate or modify influences that are unfavorable and encourage and establish those that are favorable. In other words there are ideal conditions under which cattle will grow and develop to the best advantage and the nearer to those ideal conditions the stock are put the more successfully they can be grown. Among other conditions that go to make up the ideal is one that is included under the general term, comfort, and the object of the following production is to discuss and emphasize the influence of the different factors in the environment of cattle that have to do with the comfort and contentment of the animal.

Comfort in the barn yard is and has been a sadly neglected but important factor in stock production and is one that demands its share of attention before the maximum profit in this business can be obtained.

Every grower of stock ought to take the following as his motto:

"CONTENTMENT IS FAT."

and if he lives up to this motto there will be no doubt that the extra trouble and expense he goes to will be reaped with high interest, when he disposes of his stock.

IDEAL CONDITIONS UNDER WHICH CATTLE THRIVE BEST.

Probably the best conditions for cattle growing that have been approached as yet is in June when cattle are allowed to run in luxuriant pastures with plenty of clear running water bordered with shade trees. Nowhere else have cattle been known to thrive so readily in the best of condition, health and contentment.

In June when grass is at its best, when temperature is not too hot, when the air is fresh and balmy cattle are surrounded by an environment that is ideal in respect to feed, climate, and comfort. The animal is perfectly contented with nothing to interfere with its mental or physical condition. All the functions of the body can be performed in obedience to the first laws of nature, without interference or derangements due to improper care, climate or mental states. All is serene and contentment. Such is the ideal environment for the production of beef or dairy products, and if a calf could be born and raised under such conditions for a lifetime, the importance of environment and treatment could be discerned at a glance.

In the history of various breeds of cattle those that have been grown for generations where climate is mild, grass luxuriant are superior in size and quality, and function while those grown under diverse conditions of climate etc. are just the reverse.

June conditions only last for a few weeks during the year. In spring grass is not very nutritious; the summer is too hot; the grass is dry and unpalatable in autumn, and in winter the weather is cold and the feed dry and scarce. The best that man can do is to modify conditions toward the ideal as much as possible and what he can do is a great deal if properly done.

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In winter the cold can be avoided by warm barns, the feed supplied in abundant quantities and made as palatable as possible. In summer heat can be made less noticeable by supplying proper shade. More nutritious food can be supplied in spring but other factors cannot be controled so easily.

INFLUENCE OF SHELTER ON CATTLE.

Among the necessary essentials of man is shelter, and this requirement has been met with to perfection. The necessary essentials of cattle are food and water but shelter is not included as a necessity as cattle live and have lived without it. What shelter has done for comfort and welfare of man can be seen at a glance but what shelter has done and will do for animals seems to have escaped the attention of a great majority of the growers of live stock.

Cattle in a wild state developed and reproduced successfully without shelter but wild animals of all kinds find in nature some form of protection from extremes of heat and cold. The cattle of to-day are vastly different from what they were when in a wild state and have so changed and molded by man's ingenuity that they no longer possess the endurance and rustling abilities that they once displayed. These have all been lost by the artificial treatment and conditions afforded them by man.

That shelter was necessary for successfully growing cattle was recognized as far back as we have records. Early English writers mention stables for cattle. The Bible speaks of stables for the shelter of sheep and oxen. The earliest records of the Arabs show that they shared their tent with their live stock. Thus we see that most primitive raiser's of live stock were familiar with the value of shelter, and it along with good feed and treatment has developed the mod-

ern specimen of beef producing and dairy animals that seem to be very near the limit of perfection. The history of the various breeds of cattle prove that shelter is a dominant factor in raising the standard of excellence of animals. Where cattle are compelled to endure severe climatic conditions a small hardy, rugged animal with remarkable vigor is the invariable result and such an animal is about as far away from the ideal animal of to-day as it can possibly get.

The value of shelter even in this age of development is not realized by the majority of cattle raisers. Probably it would be safe to say that seventy-five per cent of the farmers and ranchmen disregard shelter entirely or have quarters that are no better than the open or a good wind-break. Definite data along lines of growth and development of exposed cattle as contrasted with sheltered cattle where feed conditions are same and plentiful, is lacking but such work would undoubtedly result in some interesting information. That such exposure stunts the growth and interferes with the best development is self-evident but what effect it would have on one generation is open to investigation. Its effect after a number of generations has many living examples.

The West Highland Cattle owe their size and ruggedness to exposure to severe climatic and topographical conditions. The vitality, energy in form of heat, and vigor required to withstand the cold blizzards and snow storms are detracted from their work in building up and developing the various parts and organs of the body, thus the maximum growth attainable is impossible, unless shelter is afforded the animal. Besides the lessened growth and deficient quality of the animal more feed is required to produce the extra amount of heat that is generated to keep up body temperature. This is burning costly feed

by a costly process, for the digestive and excretive organs of the body would have to do an extra amount of work handling this extra amount of feed.

Aside from the money standpoint is the humanity side of the question. The sufferings and hardships gone through with by cattle is something dreadful to think of. In cities laws have been enacted preventing cruelty to animals, and officers of the Humane Society will shoot down a poor lame horse drawing a Dago Peddler's cart and the law approves it but thousands of cattle can starve and freeze to death in the Western and Northern states and the law says nothing and the Humane Society says nothing. A law compelling erection of suitable shelter for cattle under such conditions would be just as justifiable as laws passed in cities preventing cruelty to animals.

The cattle are at your mercy, unable to seek shelter for themselves and it is the duty of the owner to provide comfortable shelter for them.

BAD EFFECTS OF COLD RAINS AND WET SNOWS ON CATTLE.

Where cattle are compelled to stand out in cold rains or wet snows of the winter, all water or snow lodging on the animals has to be evaporated off at an expenditure of heat from the body. Every one knows how cold and disagreeable it is to have on wet clothes even in comparatively mild weather. Cattle feel the same way, just as cold and just as disagreeable. An average animal presents approximately about eight square feet of surface for lodgement of rain or snow. During a slow, drizzling rain in the winter time nearly all the moisture that falls on an animal is evaporated off. Thus if an inch of rain fell on the eight square feet of surface presented by the animal there would be 1152 cubic inches of water to be evaporated. This

amount is equivalent to 0.66 cubic feet or 41.25 pounds of water. The theoretical full value of one pound of beef fat is 16,331 heat units and that of average milk is 1148 heat units. It requires 9666 heat units to evaporate one pound of water, therefore the number of heat units required to evaporate 41.25 pounds of water would be,--

$$41.25 \times 966.6 = 39872.25 \text{ heat units.}$$

To evaporate this amount of water off an animals back during a continued rain would require,--

$$38,872.25 \div 16331 = 2.46 \text{ pounds of beef fat if the heat was furnished from this source.}$$

If the animal was a dairy cow and the source of heat milk, it would require,--

$$39872.25 \div 1148 = 34.7 \text{ pounds of milk to evaporate it.}$$

It is not very likely that this amount of heat would be derived at the expense of milk, but most of it would come from fat stored in the body of the cow. But it is equivalent to that amount of milk and by the time this required amount of fat is restored to the body the amount of milk determined would be deprived from the milk pail.

In a herd of fifty steers exposed to an inch of rain in winter there would be a loss of --

$$50 \times 2.46 = 123 \text{ pounds of fat due to its use in evaporating the rain off their backs.}$$

In the case of fifty dairy cows there would be a loss of,--

$$34.7 \times 50 = 1735 \text{ Pounds of milk.}$$

In addition to the cold rains are wet snows which are much worse than rains as snow lodges better and requires a longer time to melt it. Besides the 966.6 heat units required to evaporate it as water, snow requires and extra 142.65 heat units to melt it, making a

total 1109.25 heat units to remove snow in form of vapor. To melt and evaporate 41.25 pounds of snow would require,--

$$\frac{1109.25 \times 41.25}{16,331} = 2.8 \text{ pounds of beef fat per ani-}$$

mal. The amount required of milk would be,--

$$\frac{1109.25 \times 41.25}{1148} = 38.9 \text{ pounds per animal.}$$

The average rainfall of Kansas is thirty-four inches annually. About one-fourth of this total amount would fall under conditions mentioned above. This means that 8 1/2 inches of rain or snow equivalent to rain would fall on the cattle during the winter months. Figuring this out from a rain standpoint it would require,--

$2.86 \times 8 \frac{1}{2} = 20.91$ pounds of beef fat to evaporate 8 1/2 inches of water from an animal, and in case of snow,--

$2.8 \times 8 \frac{1}{2} = 23.8$ pounds of beef fat to melt and evaporate snow equivalent to same amount of water.

If the source of heat was milk as in dairy cows it would require,--

$$34.7 \times 8 \frac{1}{2} = 284.95 \text{ pounds in case of rain and}$$

$$38.9 \times 8 \frac{1}{2} = 329.65 \text{ pounds in case of snow.}$$

Allowance is not made for shedding of water as this is variable depending on rate of falling and rate of evaporation but other allowances have been liberal enough to offset this difference, just the rain that falls through winter months being taken into consideration. In addition to this is the rain that falls in spring and autumn but as weather is usually mild the effects are not very great especially where rain falls in quick, hard showers as it does in spring and summer. Such rains are of benefit as they wash and clean hair and skin of cattle to some extent.

The problem of loss can be easily solved by furnishing the necessary shelter and for this particular kind of loss anything that will keep off the rain or snow will suffice. Besides the actual loss of beef fat and milk there is a waste of time and energy to produce these extra amounts. A person that had been exposed to such a rain getting wet and cold, would expect a severe cold if not something worse as a result. Probably animals health would not be injured much but there is the same tendency to take cold or other diseases and all living animals are susceptible to diseases in different degrees. Frequent and severe exposures to cold rains and snow storms certainly tend to make an animal more susceptible to the diseases that arise from such exciting causes.

SHELTER CONTRASTED WITH EXPOSURE.

Perhaps more money has been lost and more failure incurred in feeding steers for market than along any other agricultural line. The causes of such failures are varied and depend upon many things, but it will be safe to say that a great majority of them are due to neglect of the little, seemingly insignificant factors in steer feeding. Probably one of the most neglected factors of this art is the comfort of the steer. Several experiments along the line of shelter or feeding steers without shelter and steers provided with comfortable quarters have been carried on with the same general results. As an example the experiments carried on at the Kansas State Agricultural College will be taken. Here three different experiments were carried on. In each case five steers were tied up on the barn and five fed in an open yard, with access to a shed. In each case both lots were fed on ear corn and one coarse fodder of the same kind and quality and they were fed all they would eat of these. Lot I steers were fed

on an average of 182 days including the month of April and May when the climatic conditions were such that open lots would be preferable to indoors.

FIRST EXPERIMENT.

How Fed	Feed and Grain per Head				Lbs. corn gain	Lbs. fodder per lb. gain	Cost of 100# grain	Total cost of feed per head
	Ear corn Lbs.	Corn fodder lbs.	Hay lbs.	Gain lbs.				
Lot I Outdoors	4871	907	673	313	15.5	5.0	\$8.05	\$25.20
Lot II Indoors	4027	832	509	284	14.1	4.6	7.47	20.83
Difference	844	75	164	29	1.4	.4	.58	4.37

Experiment One was repeated with an equal number of steers under same conditions. This time they were fed 129 days.

SECOND EXPERIMENT.

How Fed	Feed and Grain per Head				Lbs. corn gain	Lbs. fodder per lb. gain	Cost of 100# Grain	Total cost of feed per head
	Ear corn Lbs	Corn fodder lbs	Hay lbs.	Gain lbs				
Lot I Outdoors	3158	1444		2756	11.1	5.2	\$6.03	\$16.64
Lot II Indoors	2723	1214		2738	9.9	4.4	5.22	14.30
Difference	435	230		18	1.2	.8	.81	2.34

A third experiment was carried on in 1895-'96 and was continued 147 days, From Oct. 23, to March 18.

THIRD EXPERIMENT.

How Fed.	Feed and Grain Per Head			Lbs Corn per lb. gain	Lbs fodder per lb. gain	Cost of 100# grain	Total cost of feed per head
	Ear corn lbs.	Fodder lbs.	Gain lbs.				
Lot I Outdoors	3372	457	2172	15.52	2.10	\$4.35	\$9.45
Lot II Indoors	3222	535	2298	14.02	2.32	3.99	9.18
Difference	150	-78	-126	1.5	-.22	.36	.27

In this case the difference is not so great, due to the exceptionally mild winter, the temperature indoors only averaging 5.8 degrees above that outdoors.

If we average the results of these three experiments in which the steers were handled alike, and fed alike, under Kansas conditions, we find that the outdoor steers have eaten, per head, 476 pounds of ear corn and 281 pounds of fodder at a cost of \$2.33 more than the indoor steers. They have on the other hand gained six pounds more per head, worth on the market, on which they were sold about 25¢, leaving \$2.08 as a tax on outdoor feeding. Or putting it in another way the cost per pound of gain for outdoor feeding averages rather more than a cent over and above and the cost per pound of gain for indoor feeding.

Experiments carried on at the Texas, Iowa, Utah stations report the same general results. That is the indoor steers eat less per pound of gain and as a rule make slightly the larger gains in all cases. This extra amount of feed eaten by outdoor animals goes to keep up temperature of body. Animals standing exposed as they do to elements require this extra heat to make up for that which is

conducted away by cold winds and atmosphere. In this case the steers had access to a shed that was boarded up on three sides and this afforded considerable protection from wind and especially from rain and snow that are very trying on animals exposed to them. If this shed had not been afforded them, the test would have been more complete and there would have been a greater difference in results.

The beef steer with his thick layer of fat does not feel the cold and disagreeable weather as much as growing stock or dairy cows do. These are thin skinned and have no layer of fat to ward off cold or to keep heat in. The value of shelter for dairy cows can be seen in the following experiment carried on at the Indiana Station by Plumb. Six grade cows were divided into two lots of three each, the lots being as nearly equal as possible in all respects. One lot was housed in stable except on pleasant days when an hour's exercise was allowed. The other lot was subjected to exposure regardless of weather from 8 A. M. to 4 P. M. In a protected corner of the yard there was an open shed which furnished shelter to some extent. The trial lasted 48 days during which time the cows exposed ate 512 pounds less hay but 388 pounds more corn and 368 pounds more bran than the housed lot. Despite the extra feed they shrank 33 pounds in weight while the sheltered lot gained 231 pounds and gave 161 pounds more milk. Plumb summarizing the results gives the following financial statement.

Saving in cost of feed eaten- - - - -	\$4.23
Value of extra milk, 161 pounds - - - - -	2.79
Value of 231 pounds of grain - - - - -	<u>5.77</u>
Amount saved by sheltering 3 cows 48 days - - - - -	\$12.79
" " " " 1 cow 48 " - - - - -	4.26

These results show the vast importance of shelter for dairy cows which is much more important than that for fattening steers. In the above experiment the exposed lot was housed during the night and had better shelter during the day than thousands of dairy cattle have throughout the north and west. Where dairy cows are subject to exposure 24 hours during the day, the loss due to exposure must be much more than was the case in the experiment. At this rate a dairyman could build a comfortable and up-to-date barn and soon pay for it in increased profits from the herd.

Exposure would have about the same effect on growing stock as it does on the dairy cows, and where growing animals are exposed to the elements five months of the year for three or four consecutive years their growth and development must be greatly retarded and stunted in addition to the increased expense of keeping them. Also such exposure is disastrous to the health and vigor of the cattle, predisposing them to disease, weakening their constitution etc.

Any man could afford to erect a barn or suitable comfortable shelter for his herd. If he realized what he was losing every year on account of lack of shelter he probably would build as soon as he could get necessary materials, and the loss prevented by such shelter would soon repay for money invested, and the satisfaction of having cattle comfortable and contented would be clear profit.

A WORD ON CONFINEMENT.

In the above experiments the steers fed indoors were all tied in stalls, thus being put under unnatural conditions, and deprived of exercise that is so necessary to maintain the health of any living animal. If these steers (and this applies to all cattle) were put where they could get under comfortable shelter at will as well as have access to the open lot they probably would have made better gains on same amount of feed. Standing confined day after day is a very unsatisfactory condition to require of any animal. In the human subject one knows how tiresome it is to stand for any length of time. A person must walk, sit, and lie down, and do various things to be comfortable all the time. Any one thing if kept up for any length of time is tiresome. So it is with animals. Any observer will notice that they spend their time in various ways. Part of the day they are lying down, part of the time they will be standing up or strolling around for exercise.

In the feed lot you often see steers playfully and gently butting heads as if they enjoyed it. Young calves are playful creatures and when not confined will take many playful runs and frolics. All these different phases of an animal's time and actions arise from some want or requirement in an animal's nature, and denying cattle any of these will have an effect that will be hostile to best possible gain and development. An animal is rarely contented when confined. The natural habitat of cattle is out in the open, under clear skies free to roam at will, free to follow their own instincts and desires and any confined animal has a longing to get out where it has more or less freedom and this longing is more or less hostile to good gains or best flow of milk.

This is especially noticable in the spring with dairy cattle that are kept confined indoors. In March and April dairymen always look for a decrease in the amount of milk yielded due to the fact that cows have become restless and uncontented; perhaps longing to be out in the pasture feeding upon grass and enjoying the budding of nature as all animal life enjoys it. Shelter then is a second choice that is resorted to when the open is not agreeable. The animal is to be judge of which is best for him, and there is no doubt but that in this case he is highest authority.

ESSENTIALS OF A GOOD SHELTER.

A person traveling over the country may see all manners and kinds of contrivances made to answer the purpose of a shelter. They are from a two wire barb wire fence to the best of modern barns. A good shelter must provide ample protection from rain and snow, cold and heat and afford an animal a dry pleasant place to spend its time during inclement weather. The degree of protection varies with the cattle. Fattening steers can get along comfortably in an open shed boarded up on three sides. The shed would be better if part of south side were boarded up so steers can avoid raw south wind whenever necessary. All cracks and spaces should be closed so that drafts will be avoided. Cold drafts are worse than open wind as far as comfort and the health of the animal is concerned. Floor of shed should always be kept dry and clean so animals will always have a comfortable place to lie down.

The dairy cow with her semi-daily loss of nutrients in an abundant flow of milk and the animal drain of maternity requires shelter that is warm and constant. Shelter of this kind is only fur-

nished by the best built barn. The walls should be thick and free from cracks and spaces that permit drafts. In cases of extremes of cold the heat from the animal must keep the barn warm and where there are unnecessary places for loss of heat this is impossible and the barn may get as cold as the open. The value of shelter for the dairy cows is seen in the forgoing chapter and it is something that a dairy-man cannot profitably neglect.

Very often the location of lots and sheds may materially affect the comfort of the animals. The idea that a hollow or a ravine is a good place to locate lots is a very prevalent one. Ravines afford considerable protection from winds when they run at right angles to direction of wind but when parallel they are as bad as the open. In a still atmosphere they are worse than a hill-top as the cold damp air settles in the low places and often a stream of cold air blows slowly down a ravine similar to a stream of water. This is especially noticeable in spring and autumn but is prevalent at all times.

The protection of timber or groves is often imaginary. In limited groves the wind is often as fierce and hard as in the open. Then the snow stays on longer in the winter showing that it is cooler than the open. In many cases though timber affords excellent protection from wind and an open space completely surrounded by tall thick timber providing it is not in a ravine or a low place surrounded by higher ground.

Shelter from extremes of heat in July and August is also very essential to comfort of cattle, and nothing is better than a good thick grove of trees. Sheds afford protection from the direct rays of the sun but the atmosphere is heated by reflection of heat and light rays. Trees absorb a great deal of the heat and atmosphere is cooled

by evaporation of water transpired by leaves. Where natural groves cannot be obtained one should be planted in some convenient part of the pasture, preferrably near watering places. Such a grove would grow above reach of cattle in six or seven years but from thence on provide a cheap and excellent shelter for your cattle for a lifetime.

EFFECTS OF DRINKING COLD WATER.

A cow drinks on the average about 70 pounds of water per day. In severe climates cattle are almost universally compelled to drink ice-cold water, usually through a hole cut in the ice. Drinking under such circumstances becomes a hardship and cattle will not do so until compelled to by thirst and when they get started they will drink larger quantities which causes them to stand around and shiver with cold for several hours. Water taken in at about 32 degrees has to be warmed up to the temperature of the body (100 to 102 degrees F) this demands a large amount of heat which cannot be supplied immediately. It reduces internal temperature thus interfering with the functions of many organs numbing them for a time. The sudden entry of this bulk of cold water also produces a shock on the nervous system that interferes with its direction of the animal mechanism, digestion ceases until the proper temperature is again regained.

The amount of heat required to bring 70 pounds of water to the proper temperature (101 degrees F) would be:

$$(101^{\circ} - 32^{\circ}) \times 70 \text{ lbs water} = 4830 \text{ heat units.}$$

If this amount of heat had to be furnished at the expense of milk it would take 4.2 pounds or if it were at the expense of beef fat it would require .7 of a pound. From this we see that 4.2 pounds of milk is deprived from the pail daily to warm up the water a cow drinks, and .7 of a pound of gain if the steer is sacrificed to warm

Besides this loss is the shock to the animal's system and its interference with the working organs of the body which decrease the output of milk or fat. The cattle can be saved this extra work, loss, and hardship by supplying watering tanks with heaters. Such heaters cost but little, require only about fifteen minutes work in the morning firing up, and the extra cost, work and fuel, is repaid by the extra gain of only two or three steers or milk cows while larger gain of others is clear profit. When water is kept about 70 or 80 degrees the cattle will not hesitate to drink frequently, thus the bad effects of going without water until thirst forces them to drink will be stopped.

Another unprofitable feature about water is having it located at a distance away from pasture. Many persons will not go the labor and expense of digging a well and putting up a wind mill as long as natural water can be obtained, no matter how inconvenient it may be for cattle to obtain it. Many places the supply of water is so far away from pasture that it is a hardship for cattle to get to it. When cattle have to travel a mile or so for water they will only go once a day and then drink enormous quantities at once, which is undesirable. Drinking lesser amounts more frequently gives more satisfactory results. Any person can afford to drill a well and put up a wind-mill in some easily accessible part of the pasture. The increased gain and growth of his herd would repay him in a year or two.

VENTILATION.

That feed and water are indispensable to live stock is realized by man and as a rule supplied in sufficient quantities, but the value and importance of air to animal life is often overlooked. It is obtained so easily and unconsciously that its necessity does not occur to man. When large numbers of cattle are housed together in close stables provision must be made for ingress and egress of air.

Air once breathed contains a certain amount of C O₂ moisture, ammonia, marsh gas, and organic matter which are constantly being given off by the lungs. In improperly ventilated barns, the moisture often condenses on ceiling and walls and this is one of the surest indications that ventilation is needed. When one passes from fresh air into an occupied stable or room where air is impure a depressed feeling and offensive odor are recognized and sometimes this effect may be so strong as to produce nausea. Such air is dangerous. That some of the air given off by lungs is strictly poisonous is proved by the following experiment. A mouse was confined in a closed fruit jar until it was nearly suffocated and then taken out, and another one put in, which died immediately. It seems that air breathed by one is more dangerous to another.

Brown-Sequard condensed some vapor given off by lungs and injected it into a rabbit which died from the effects. They claim this poisonous substance is a volatile alkaloid given off by the lungs.

In old unoccupied stables or rooms there is always more or less dust bearing bacteria and spores which are dangerous to the health of the occupants. Strong ventilation tend to remove these organisms and dust particles with the air.

That bad ventilation predisposes to disease in the human

family is a self evident fact recognized by all familiar with Hygiene. The run-down weakened condition which poor ventilation is bound to engender, will certainly tend to start a case of contagious disease which will be contracted by stronger animals when once it gets a foothold. The only way to fight these invisible foes is to keep animals in best of conditions and health and they will be able to ward off most germ diseases.

The amount of air breathed by a cow in twenty-four hours is 2,804 cubic feet as computed by Colin and the amount of consumed is 11.04 pounds.

A thousand pound cow requires about 30 pounds of feed and 70 pounds of water or in round numbers 100 pounds of solid and liquid food.

A cubic foot of air weighs about .08 pounds hence,

$$2804 \times .08 = 224.32 \text{ pounds.}$$

of air is required, which shows that a cow needs to be supplied with twice the weight of pure air than she does of food and water combined.

The great majority of barns and shelters of the country are such that the subject of ventilation needs no attention as it is amply supplied by cracks, open doors, etc. But where good barns are constructed there is often no provision for ventilation. The writer has seen a great number of cattle apartments in a barn that has no other means of ventilation other than that of a closed door; windows and flues were minus and on a still night ventilation would be impossible. The air under such conditions would get almost deadly and the effect on animals is disastrous to best health and vigor of constitution.

A barn or room to be properly ventilated ought to have air

completely changed every time 3.3 per cent of it was breathed. Thus a cow would have to have 3542 cubic feet per hour. The rate of change of air therefore would depend on the number of cattle confined. The rate that air will blow through a flue varies from 200 to 500 feet per minute without mechanical forcing. If the air passes through the flue at the rate of 300 feet per minute it would take a flue 2x2 to supply air for 20; 3x3 for 60; 4x4 for 80; and 5x5 for 100 head of cattle.

The construction and arrangement of ventilation is so varied under different conditions that a detailed discussion cannot be given here, so just a few important principles will be mentioned. A ventilator should be constructed with air tight walls so that air cannot enter except through the lower opening. It should rise above the highest portion of the stable, be as straight as possible and have ample cross section. One large one is better than several small ones of the same capacity. Best location is as near center of stable as possible. The openings of ventilators are subject to many different arrangements but it is essential to have ingress near ceiling and egress near floor. Also best to have air enter back of animals so that it will carry breath of animal out of flue immediately. Care should be taken to avoid drafts as they are injurious. The subject of ventilation is one that cannot be neglected for it is essential to maintain the health and vigor of your herd, especially with breeding and dairy animals. Upon the health and vigor of the breeding cows depend the health and vigor of the future herd and unhealthy animals always transmit a tendency of same to their offspring. Upon the dairy animal depends the contents of your pocket-book and anything that hurts the health of the cow tends to interfere with her enormous work in producing milk thus decreasing the amount of milk given.

LIGHT.

Another neglected feature of stables and sheds is light. Many barns are built without a single window and barn is kept dark the year round. Just what effect the exclusion of light has on an animal can be deducted from the following report where two dark red calves were taken and one put in a dark room and the other given rather close quarters with plenty of light. Each calf received exactly the same feed and treatment. At the end of the experiment the calf kept in the dark weighed 360 pounds and the other weighed 430 pounds, a difference of 70 pounds. Besides this difference in weight the coat of the dark room calf's was faded and a sickly yellow in appearance and the general condition of animal indicated unthriftiness and lack of vigor while the other calf was in comparatively good health and condition. The eyes of the calf kept in the dark were weakened and tender and did not get accustomed to the light for about three weeks. In the meantime they were kept closed.

Both calves were put under exactly the same conditions after experiment, but the dark room calf never recovered from the effect of the experiment. Thus we see that light is a necessary factor for animals as well as plants, and every barn or shed should have enough windows to thoroughly light up the interior of the building. A dark room or enclosure always has a dreary and unpleasant aspect which has the same effect on cattle as on men. Man likes to have things bright and cheerful and is happier and more contented under such circumstances. The brighter and more cheerful-looking a stable is the more contented the animals will be, and, "Contentment is Fat."

Aside from the pleasant part of light there is a still more important and valuable service of light. Light is a great purifier

and disinfectant. All bacteria exposed to the direct rays of light are killed or attenuated. Light dries up secretions and excretions of the body, it purifies the air, tends to dispel odors and in many ways is of benefit to the environment of the barn. The light should come from downward and behind the animal, never directly in front of the cattle especially if it is intense.

MANURE AND MUD IN CORRALS.

Perhaps the most disagreeable condition cattle have to contend with is mud and manure. Many farmers pay no attention whatever to the amount of manure that accumulates in stables and corrals. The writer has seen shed floors and corrals where manure was actually knee deep with no place for the cattle to lay or even stand in comfort, and when an animal tried to lay down it became fairly plastered with filthy irritating manure that dried to the hair making an undesirable coat for cattle to say the least. Cattle under such conditions soon learn what it is to lay down in such a mess and will stand up for weeks at a time getting no rest whatever. They hate to walk around because mud and manure is deep and therefore do not get enough exercise to maintain an excellent degree of health or comfort.

The manure irritates the feet and legs and cattle kept in such conditions frequently get sore feet and quitters. Also constant contact with filthy manure and mud predisposes feet to many diseases and is the cause of exciting many. The air they breathe is always tainted and polluted by odors and vapors caused by decomposition of the manure that affect lungs and passages, irritate all mucous membranes and tender portions of the body that it comes in contact with. Perhaps you have noticed the fumes of ammonia that are so prevalent in horse stables in summer time, and their acute irritating action

which may be so great as to cause actual pain, just imagine what the effect would be if you were compelled to remain in such a place all the time even under much better conditions than just mentioned. Cattle kept under conditions as above never have the healthy, glossy appearance that animals in best of health and condition should have. The skin does not perform its functions perfectly, becomes diseased, and filthy and lousy. When the skin does not perform its functions other organs are overtaxed and the system becomes clogged with matter that should have been excreted through the skin thus affecting the entire system, making it susceptible to disease.

A bull confined in a basement barn with manure knee deep and having the appearance described above left his condition stamped on his offspring in an unhealthy and diseased skin. This shows the marked tendency to transmit disease to offspring and the importance of keeping breeding animals in best of health.

Manure in barns should be cleaned out every day or so and dry bedding provided to absorb liquids. Lime dusted around over manure will do away with fumes of ammonia that are so irritating in warm weather. Out doors in corrals when it is not practical to haul manure very often large corrals should be provided thus lessening the amount of manure in any one spot. Best location for a corral is on a slope where manure tends to work or wash away leaving a clean place. Best policy is to remove manure as fast as it accumulates and in doing this you make things more comfortable and clean in the farm yard, and save a great per cent of manure for your land as loss is prevented from wash and fermentation.

DEHORNING CATTLE.

Where cattle are bunched together in large herd's they should be dehorned by all means. Very often you find persons who object to dehorning cattle from a standpoint of cruelty. A herd of horned cattle confined in a lot will cause more suffering and commit more cruelties a thousand times over by reason of having horns than any that may be caused in a few moments of pain which result from the operation of dehorning. Dehorned cattle are less inclined to fight, the tendency to boss and domineer is greatly lessened and the weaker and timid ones have better chance to hold their own.

The best and most humane way to dehorn cattle is by means of applying caustic potash to buttons as soon as they form on the calf's head. Horns can be removed in this way with very little pain or excitement to calf and expense is practically nothing.

FLY TIME.

The only unsolved problem as far as comfort of animals is concerned is the fly problem. These little insects play havoc with peace and gain of cattle during the summer season, by continually worrying them. Dark barns keep them off but this is rather impracticable with large herds. Several mixtures of certain substances keep them off successfully but no practical remedy has been discovered as yet. Mixtures made so far require too frequent application and are too expensive to use profitably. Any one who will invent, compound or discover a practical remedy for flies can become a millionaire in a few years.

TREATMENT OF ANIMALS.

In addition to the foregoing factors that make environment

of cattle pleasant and comfortable is kind treatment. The value of kind treatment of the dairy cow is recognized by all skillful dairy-men. Any abuse or mistreatment of the dairy cow is followed by a decrease in the amount of milk given. The least excitement or sudden change of environment or condition is detrimental to maximum flow of milk. The cow has to have kind gentle treatment free from all excitement or worry and unless she has such treatment she cannot do her best in production of milk. The cow's nervous system is so delicately organized that it is easily disturbed or excited and one cannot be too careful in her management.

To get the best results and avoid bad effects of wildness of your cattle, they should be made pets of when young. Calves should be handled and fondled until they become old enough to remember it and they will always be easy to care for and handle when old. Make the cattle your friends and they will pay for it on the market. An old steer feeder of Kansas who had been quite successful in buying and feeding steers attributed his success to the fact that he made pets of his steers. He would go into the yard, pat and fondle them, talk to them, feed them choice articles of food etc. On cold dreary days he would go out and cheer his steers up, feed them handfulls of food and get them to eating when they did not feel like it. You know that it always makes you feel better and more like living to have some one interested in what you are doing and your welfare. Just so with these steers. On cold dreary days when they had the blues and did not care whether they ate anything or not, this old man came out cheered them up, got them to eating, and after a while they got to thinking life was worth living after all and they might as well eat and grow fat as to stand around, thus keeping up gain that is so es-

sential to a feeder's profit.

It is not a bit more trouble to handle cattle gently than to pound them with clubs etc., and when one method is a profit and the other a loss one shows lack of common sense to let his impatience or temper get the better of his judgement.

Perhaps the greatest mistake that most people make is in handling a bull. As a rule a bull is regarded as a ferocious, dangerous animal that has to be driven with a pitchfork or pulled around with a ring in his nose. A young bull can be taken and made a pet of when a calf, grown under kind treatment and proper care, and be as gentle and easily handled when mature as any cow. A bull has a good memory and when misused or treated harshly usually remembers it and will get even when he gets a good chance. A bull's temper can be easily ruined and the gentlest animal made dangerous by bad treatment.