of powerful artesian bores, the construction of a well serves an important purpose. The pump may be installed low and if possible the engine itself. The suction lift of a pump as has already been stated above, is practically limited to 25' and hence in situations where deep pumping is a desideratum, the pump has to be installed at a fairly great depth from the ground level. We shall deal with 'Methods of Deep Pumping' in the next article.

H. Venkatramaniah.

Milk from cow to consumer on the Government Dairy Farm, Bangalore.

or

The Care and treatment of milk from the time it is drawn off the cow till it reaches the consumer.

Now-a-days we hear much about "clean milk," not only as regards suspended impurities visible to the naked eye but clean from a bacteriological point of view. In every health officer's report we see the wail set up for better quality of milk and also tbe reason for greater infant mortility. To sum up, he sets the defective milk supply as the root cause. It has been clearly shown by eminent bacteriologists beginning with L. Pasteur, that milk forms one of the best sources for the growth of such fell diseases as consumption, enteric, etc. Under such conditions it is no great wonder that the Indian Government should have Dairies of their own, un on modern principles under trained managers, for the production of milk under the best sanitary conditions for the benefit of the Military. In the following few pages I will try to give what I have seen in the Military Dairy Farm at Bangalore as regards the treatment of the milk ere it reaches the consumer.

First let me take the care and treatment of *Cows and Buffalos.* The herd consists of both cows and buffalos, the latter predominating. The animals are well housed in clean, sanitary sheds and stand very little chance of having their bodies soiled since the dung and urine fall away into the gutter behind. Moreover the sheds are cleaned well with water every day. The troughs and pillars are regularly white-washed at least once a week. In short all possible precautions are taken to keep the animals clean i. e., to keep the animals free from any out-break of disease. Just before milking the udders of animals are washed with a weak solution of condey's fluid and then wiped dry with a clean towel. During the milking time the dung is regularly removed so that no contamination may take place. Thus as clean a surrounding as possible is made for the milk man.

Guvallas. These are professional milkers. Each guvalla is provided with a complete set of clothes during milking. They hand it back to the soldier in charge as soon as milking is finished. The process of milking is closely supervised by the soldier in charge. The milkers first wash their hands in condey's fluid before they begin milking. The same thing is repeated whenever they milk an animal which has an affected udder. The soldier in charge is expected to report whenever he observes an animal "off condition" or animals with swollen udder etc. The milk of such animals is condemned lest the animals should be suffering from contagious Mammities or Tubercular udder etc.,until it has been proved to be otherwise.

Milking. "The whole hand" method is used. The guvallas are not allowed to wet their fingers before milking but only moisten their fingers just to give them an easy grip. The milk is collected in buckets.

Recording. As soon as an animal is finished, its milk is carried to the Recording shed where a clerk in charge makes a record,

of the milk yielded by each animal, morning and evening separately. When the bucket is full the milk is poured into cans through a filter which is provided with fine wire sieve and also a fine muslin. Thus as far as possible all suspended impurities are retained by the sieve and muslin. No doubt the milk will contain some of these impurities in liquid form When a can is full it is closed by means of lids and thus completely guarded against flies and dust laden air. When all animals are milked the cans are carried to the Dairy for further treatment and storage before it is distributed.

Dairy. The whole dairy building and its surroundings are kept scrupulously neat and clean. All the windows and doors are covered with wire mesh so that our deadly foe, the fly, is kept away. The equipment is of the most modern type and all the machinery is driven by overhead shafting and pulleys by belts.

Pasteurisation It is well known that all harmful bacteria i. e., germs grow only at blood heat temperature. When the milk is heated to 180° F. all grown up germs die but only spores remain. This was the lesson taught by Leuis Pasteur, the father of Bacteriology. Hence we may define Pasteurisation of milk as "the application of heat to milk for the purpose of destroying or checking the growth of undesirable micro-organisms therein." As said already pasteurisation will destroy only living micro-organisms but cannot destroy their spores. To destroy the spores we must have recourse to sterilisation which is impracticable in a large dairy. So we see that whenever milk gets contaminated it will remain so in spite of Pasteurisation. On the other hand if we heat the milk to a sufficiently high temperature for a certain time so that all grown up bacteria are killed and then cool it suddenly to a low temperature, we can check the growth of these micro-organic germs for a sufficiently long time provided we keep the milk at that low temperature. That is what is done here. The milk is heated to a temperature of 185° F. and is kept at that temperature for 4 minutes and then the heated milk is allowed to flow down over

a series of tubes. In the upper tubes cold water circulates and in the bottom ones liquid brine circulates. Since the milk flows down over the tubes in a thin film it not only gets cooled but also aerated so that all undesirable food flavours are driven away. Thus the milk which has a temperature of 185° F. at the top gets cooled to 45° F at the bottom. The milk is collected in cans and is removed at once to the cold storage room where the milk remains under the temperature of 45° F. till it is taken out for distribution.

Treatment of vessels. The vessels i. e., cans and bottles are first washed in luke warm water. The sides are well scrubbed with brush aud then with water. They are then steamed well till the cans get sufficiently heated. Steaming is not resorted to for glass bottles. These are immersed in water at a temperature of 190° for 5 minutes.

Distribution. Up to 2 lbs. the milk is supplied in bottles and larger quantities in cans. In all cases the vessels are sealed so that no mischief might be played *enroute.* In the case of bottles, the mouths are sealed by means of paper caps and rings and in the case of cans by means of twine and seals, so that it will be impossible to open the consignment on the way.

Thus all possible precautions are taken to supply the customers with milk pure from all points of view.

M. Krishnaswami.

Reviews.

The December issue of the Madras Bulletin of Co-operation, contains an interesting article on 'the necessity for co-operative dispensaries' from the pen of Mr. C. N. Krishnaswami Ayyar, M. A., L T., the Secretary of the Coimbatore District Urban Bank.