ENSILAGE AND SILOS.

A Book of Practical Information

PROGRESS OF SILAGE AND ITS PROSPECTS.

A RESUME, PLANS AND ILLUSTRATIONS

—VIEWS AND RESULTS.—

BY SCIENTIFIC MEN, FARMERS, EDITORS,

—AND OTHERS.—

—COMPILED AND PUBLISHED BY—

THE E. W ROSS CO.,

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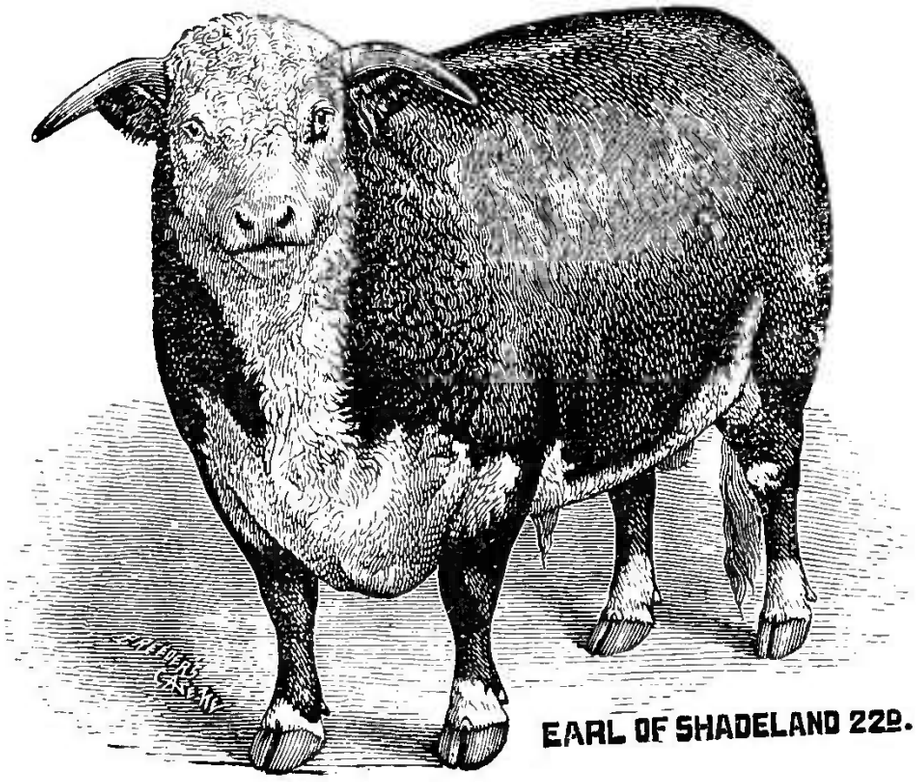
To our many kind friends and correspondents who have materially aided us by their practical experience with Ensilage and Silos, this work is respectfully dedicated.

EARL OF SHADELAND 22d.

No. 27,147



Calved May 3, 1886. Bred by Adams Earl, of Lafayette, Ind. Sire, Garfield (6975) 7015, (Lot 3). Dam, Electress 2nd 11255, (Lot 80), by Sir Bartle Fiere, (6682) 6419, (Lot 2). 2nd Dam, Anguilla 1522, (Lot 52), by Sir Richard 2nd (4984) 970A, (Lot 4.)

A prize winner in his class at Tri-State Fair, Toledo, Ohio; the Centennial at Columbus, Ohio; the Indiana State Fair, the Illinois State Fair, and the great St Louis Fair.

PREFACE.

In accordance with our usual custom, we again issue our Annual Silo and Ensilage Book, being the seventh yearly volume. The purpose of this book is to give the widest possible dissemination of silage knowledge, and keep our readers fully posted in regard to the most advanced and practical silo thought. To this end, this volume is a fresh compilation, gathered from original sources of information, and we trust that while it treads the same path with other publications of like nature, it will embody facts and points, and withal so concise and practical, that it will find room, and readers, who in its perusal will gain information that will amply repay them for the reading.

That thousands are being benefited to-day by the use of the silo, none can question; that thousands more who are "halting between two opinions," could with "faith and works" make their affairs more prosperous, cannot be gainsaid. To these and others who "have not thought on these things," this book is sent out with our best wishes and the hope that a year of good fortunes and successes may be theirs to have and enjoy.

WHAT IS THE ENSILAGE SYSTEM?

To very many farmers, and other people as well, the terms "Silo" and "Ensilage" are as unintelligible as Greek. These words are of French origin, but they have been adopted in the English language. What cans and bottles and the vast amount of fruits, meats, vegetables, etc., now preserved in them, are to the human family, Silos and Ensilage are to nearly all kinds of domestic animals. The Silo is the can or bottle, or rather the pit or cistern, or the storage box, or place in which various forage or fodder plants are preserved in a moist, green state. Ensilage means the material put into and preserved in the Silo. (En-, or in-silage, is the stuff in the Silo.) The word is now often abbreviated to simply "Silage," and is used both as a noun and verb the doing and the thing done.—(From E. W. Ross & Co., Ensilage Book of 1889.)

THE CONTENTS.

In compiling this work the effort has been made to give it as wide a range as would be consistent with a work of this character. The attempt has been to divest it of a sectional make up, and instead, make it of practical value to all farmers of the United States. That silage has its value in the South, is now attested, and that the farmer of the great West with his broad acres of corn, yet unable to care for it beyond the grain, now has the solution of saving millions upon millions of acres of valuable fodder and making it contribute to the farm revenues. The Eastern farmer, adjunct to the markets, can now cause the valleys to bear their burden of corn and clover, and the silo at command makes "perpetual summer" on the farm. The silo is for all, and opens up a new and broader avenue for success in farming.

TO OUR FRIENDS.

OFFICE OF THE E. W ROSS CO.,
Springfield, Ohio, June, 1890.

One of the distinguishing features of our series of annual books on silage has been to give only the most correct data obtainable, and present it in a clear and unmagnified form. Silage has never needed friends whose ambition should be to paint its excellencies in vivid colors, or draw upon the imagination for facts. The practical results of silage are its best claim for attention. The farmer of to-day wants crystalized facts. The improbable has very little charm for him. He is aware that something cannot be made from nothing. He sees that better attainment can only be reached by the securing of better results from material already at hand. There must be more obtained from the same substance The ton of fodder, and hay, and the bushel of grain, must be better fed to secure better results. To this must be added the saving and utilizing of a great mass of residue that has been lost. A series of economic changes that are now recognized in all successful industries, must be considered and accepted. To this end has the silo question become to be discussed; how to better save and apply the corn crop, how to raise it and harvest it most economically. The discussion of this question so far as it relates to the silo, was not long since purely local. Now it is of NATIONAL import. The silo now attracts more than the dairyman's notice, "the man for whom it was invented." The stock breeder, the horseman, and the feeder of sheep, and of swine as well, are fast becoming to appreciate the value of good silage as part of the maintenance ration, and is coming to solve for them as well, the problem of the better and cheaper support of farm stock. There has been a change, a radical change in the views and opinions of our scientific men and professors, respecting the merits of silage. From their opinions and

theories we now have experiments and results, and in the main they are favorable to ensilage. The solid, practical facts of the farm have had their influence. The results have not always tallied with the chemist's report, and as a rule, the report has had to give way to the verdict of the animals that have consumed the silage, and in milk, flesh, thrift, and condition, demonstrated that this new "canned sunshine" has a high value, and must have a place in the profitable feeding economy of the farm. The silo has become to have a literature, not only in the record of the farm journals, but in volumns and reports as well, and notable scientific men have put out books and pamphlets, making their knowledge of permanent preservation. The purpose of this book is to record such facts and knowledge, as have fallen in our way, and note all changes and ideas that have been advanced and promise still farther progress in "art" of siloing food for stock. With it we give letters from prominent men who have made the silo a success, and with them, such other matter, plans and diagrams, as we think may be of substantial use to those who are seeking after more knowledge and evidence upon disputed points. No extravagant claims are made, no infallible rules, nor theories wholly of speculation are held up as law. The reader is asked to read, consider the evidence, and we trust give a verdict in accordance with the testimony presented. To this end this book is submitted to the public, and confidently awaits its approval. This book appeals to the thoughtful farmer who desires to do better. The opinionated farmer wedded to the old way, will even pronounce the silo a humbug to trap the unsophisticated into a scheme. The class who spends time in defending old ways, and building entrenchments against new ideas, are not disputed with. The reasonable claims of the silo have "drawn the fire" of many an able, scientific man, but the man has changed his views, the silo and its valid claims remain. The silo needs adaptation to the climate and conditions as well as the silage, but this remains patent; the silo is for every farmer in this country who will accept its conditions. That is also settled, and now all that is needed is earnest, thoughtful study of the matter; and how to adapt it to the needs of every farm.

We feel that it is proper for us to state here in confirmation of our claims for competent knowledge on the subject of ensilage, &c., that we built and furnished the first Cutters for use in the East with the Silo. Francis Morris was the first in this country to erect a silo. His experiments were successful and were shortly followed by O. B. Potter,

P. Lorillard, Theo. A. Havemeyer, A. B. Darling, S. Remington, and other prominent Eastern stock raisers. For all of these gentlemen we built special Ensilage Cutters, changing and improving them from time to time, as wider experience suggested desirable. In studying the subject we have had occasion to visit many silos and have endeavored to keep pace from year to year, with the new features dictated by the experience of ourselves and others. Hence, in offering this book we feel that we have earned the right to speak confidently on the subject of Ensilage and Silos, and of our ability to build and furnish improved Cutters, Carriers and Powers fully adapted to the many and varied wants of those contemplating the feeding of Ensilage.

We desire to take this opportunity of giving credit to Mr. John Gould, of Aurora Station, Ohio, who has greatly assisted us in compiling this work. His large, personal experience in siloing and in feeding ensilage, together with his duties in connection with the Farmers' Institutes in many States, qualifies him as an expert on the subject, and has made his sources of information extensive and his opinions broad and reliable.

If this modest little book shall contribute anything to the advancement of the silo, to its literature, or shall assist any farmer to better utilize and dispose of his crop, the purpose of our undertaking will be accomplished.

THE E. W. ROSS CO.

THE SUBSTANTIAL BENEFITS OF SILAGE.

The Eastern States have the record of putting up the first silos in this country. Mr. Morris of Maryland put up the first silo in the United States and had a special Cutter constructed for him by The E. W Ross Co. At about that time in the states of Vermont, New Hampshire, Connecticut and Rhode Island, the farm revenues had continued to decrease to such an extent year by year that there were but very few farms upon which the owners depended for a living that were not heavily mortgaged. The raising of wheat and other grains could not afford them relief, and the farm lands had commenced to pass out of the hands of the old pioneers of the soil under mortgage foreclosures to an alarming extent, when the silo came as a relief. The writer has been told time and time again by farmers in the states named, that if the system of silage had not been introduced in good season for them, that they would have lost their farms. Many have said that they had been unable to keep two horses and two cows upon farms prior to the use of ensilage, that to-day are keeping four and five horses and from 20 to 30 milch cows upon the same extent of soil, solely and wholly by the assistance of ensilage. Their herds have grown in numbers, and the increase of manures has gradually enriched the soil until the revenues received have made the owners, if not rich, more than a comfortable living, with a greater or less accumulation of means. Since that time there are hundreds of farmers in other states who are making similar statements to-day.

JOHN GOULD.

The picture below will be recognized by many of our friends familiar with our Ensilage Work of last year, and by many of the farmers before whom Mr. Gould has lectured in connection with the "Farmers' Institutes of the Country." Mr. Gould is one of the very best posted man on the subject of Ensilage and the Silo, and we are glad to be able not only to give you some of his thoughts and experiences in this work, but to make our readers partially acquainted with him through this copy of his photograph.

Jno. Gould was born in the Western Reserve of Ohio in 1844. Is a strong nervy writer on the subject of agricultural resources, and everything connected with the farm or farmer. An excellent speaker full of the strength of his own convictions, and fully qualified through his large experiences as a practical farmer to instruct on the subject matter of this book. He has also had a broad experience of ten years as a journalist, connected for some years as agricultural editor with the Cleveland Press, and during the past seven years, connected as writer and lecturer with the Institutes of Ohio, Wisconsin, &c.

SILO BUILDING.

The extraordinary attention that has been given to silo building in the United States in the past four or five years, and the diversity of conditions existing has called out a great amount of inventive skill, not to say ingenuity upon the part of the builders. The original conception of a silo was a cellar, stone walled, but from this a score of "best ways" are now advocated, but after all, concentrated into about four main features; the stone silo, the wooden frame lathed and plastered, the balloon frame ceiled inside with two thicknesses of inch lumber with a tarred paper lining between, and the single ceiled silo with the one boarding well matched. There is the plan of the round silo looming up with special features to recommend it, and modifications of all these plans by combining the points of excellence in others. For example, a silo with rough stone walls and lined up inside with lumber, and various other methods that seem to offer to the builder better results than the following out of any one plan.

While the stone silo has its advocates, and many are being constructed each year, they may be said to now represent only a fractional number of the whole being built each season. The wooden silo is more universal in its adaptation, even if all else were equal, as stone is out of the question in many sections of the country where silos are most needed. The objection to the wooden silo on the score of durability does not seem to have valid weight, as wooden silos built several years since are yet in a good state of preservation, and with the advent of gas tar paint, in its many forms, notably that of a mixture of gas tar and gasoline, and applied as fast as mixed, has solved the problem of a cheap, durable and not objectionable paint; a paint that seems to resist the influences of the silage, imparts no taste or odor to the silage, and if liberally used, promises to make a silo durable beyond question, and cheapens the

whole structure to a point where any farmer of moderate means can have a silo, as well as the more wealthy. Again it is found that in silo building when wood is used, the most expensive lumber does not guarantee the best structure, but with cheaper material like good hemlock lumber, the best grade of pine culls of mixed widths, oak, beech, &c., all, when treated with this gas tar, make a silo that while cheap as regards the material, is far from a cheap sham, and to be regretted building. Often strength is made superior to minor details, and foundations are made needlessly expensive and prove poor investments beside a more rational combination of foundation and structure.

THE SILO HAS CHANGED ITS LOCATION to a great extent, and now the greater number built, are constructed in the big bay of the barn. It is found that this bay will usually afford room for a 200 ton silo, supplying ample feed for 35 head of stock for six or seven months, while the same bay would only hold hay enough to feed 16 to 18 head for four months at most. So the economy of the farm says, build the silo in the barn, save roof and outside cover, have it where the silage can be fed with the least expenditure of labor, and centralize, instead of adding to the list of farm buildings.

THERE IS A SPIRIT ABROAD that the silo in its advent has bespoken the doom of the big castle like barn, and that the barn of the future will be a long, double stable with a silo at one end, and the hay and straw barrack at the other. The double wall, tar paper lined, has in stable building proven superior to the stone wall, having an element of warmth, dryness and that other feature of great value, pure air. The premises of future silo building are hard to conjecture, but this we venture; it will be a wooden silo the world over, made durable with some form of water and moisture proof paint, and will cost below 75 cts. per ton storage capacity.

IN THIS ARTICLE it is unnecessary to describe the all stone silo. It differs in no essential from a cellar wall and must be built with the best of hydraulic cement, or it is worthless when complete. The cost of hewn stone is so great that one cannot afford to consider it, so the usual stone silo is built of small stone from field, or quarry. If stone is used it is preferable to build it all above ground, and to this end the mason needs no instruction from these pages.

IN BUILDING OF WOOD, if in the barn, the silo should be built independent of the structure though it may in part be used by putting in false girts to receive the studding of the silo, and smaller timbers used.

t is then simply a big box in the barn, without top or bottom, save the arth on which it rests. It is not wise to try and utilize the stone wall f a barn in building the silo. It is difficult to unite wood and stone, nd stone is far from the best material to come in direct contact with he silage, as it is so good a conductor of heat and cold that it is continually eversing the needed operation in perfect silage making, and preserving, nd a loss results as a rule along sides and corners, that the farmer cannot afford; as compared with the wooden lined silo. So it is better vhere there is a wall to come in contact, to line down inside with a 2x4 cantling placed flatways against the wall, and thus make the silo independent of the wall and with its air space, prevents the influences of he stone wall.

THE CHAMBER SILO.

Some farmers who desire silos in their barns cannot afford the room equired to let them go down to the basement floor, owing to the demands made upon stable room. A silo can be built upon the floor overhead, but it requires excellent foundations under it, not only to support he great weight, but to prevent the floor from springing, and opening ip cracks to let in air, thus involving the loss of more or less silage. These two difficulties overcome. the objection ceases, save the one that omes from those unacquainted with silage and its peculiarities, who ay that the overhead silo will "drip juice" upon the stock below. No nsilage made from ripe mature corn, will drip, and no material should e put into a silo for food so green and immature that it will part with ts moisture by the average pressure of the silo.

IN MANY INSTANCES it is necessary and better that the silo should e built as a separate structure but adjunct to, and as convenient as possible to the feeding stable. If the silo is to be built on soil naturally dry nuch labor may be saved as well as expense by avoiding expensive oundations. In fairly tough clay, no outlay need be made for a concrete floor, for as a rule, clay is superior to plaster for this purpose. By ome it is now believed that a 10x10 inch sill. thoroughly painted with gas tar, and also thoroughly at the ends, set in a trench its size, nd the space between the timber and soil filled in with thin water lime ement, will make a foundation as lasting as the rest of the structure. The writer of this has such a foundation in a silo, which gives the best f satisfaction, and would not be exchanged for one of stone or grout. Some advocate a good brick wall on which to rest the silo. Others think

only blocks of stone should be trusted, and a few parties build grout walls up three or four feet above the surface, set the frame upon this and run the studding down inside the wall to the floor of the silo thinking by this plan to secure a lasting foundation.

A COMPROMISE between the stone and wooden silo, "the lathed and plastered silo," has many warm advocates and they claim for it great durability. To build is to start out with the idea of a strong frame, stiff inside lining boards, well nailed to the frame, and the best of plaster made of hydraulic cement. Its most noted advocate is Prof. A. J. Cook of Michigan who claims for it, cheapness, as considered from the standpoint of durability, freedom from moisture, and air proof walls, and when covered on the outside, the dead air space keeps the frost from creeping in; an extra cost, but an insurance that pays in the end, but he has no objections to an all wood silo.

THE OTHER SILO that calls for attention is the single ceiled silo, the single inside facing, being of matched lumber, pine or white wood, or other sound lumber, free from cracks and checks, nailed upon the studding horizontally, and when ceiled up, a three cornered piece with two inch face is nailed into the corners to make an air proof joint and corner. This silo has the merit of economy, so far as lumber is concerned. If well coated with water-proof paint, it is air proof save that moisture may get into a seam and bulge the boards to the extent of opening a crack sufficient in size to admit air. Henry Talcott of Ohio, looks upon this style of silo with great favor, and gives it out solid that it is *the* silo par excellence.

THE ILLUSTRATIONS.

To turn now to our illustrations, we give in Fig. 1 a popular style of the double board silo. The foundation for this silo is made by first excavating a cellar one foot deep, the exact outside size of the silo. A trench is then dug inside this excavation "G" and a grout wall is built up to "A" A 6x10 inch sill is cornered into the wall as depicted. The studding is cut with a shoulder "D" so that a spur runs down inside the wall to the floor. The studding, if an outside structure, can be 2x8, or 2x10 inches as the case may seem to warrant. The silo is then completed by a double lining of inch boards, put on horizontally with a half lap to break joints, and render the walls more thoroughly air proof. After the first sheathing is on, the walls are papered with tarred paper, and then the second layer of boards is put on over, and well spiked

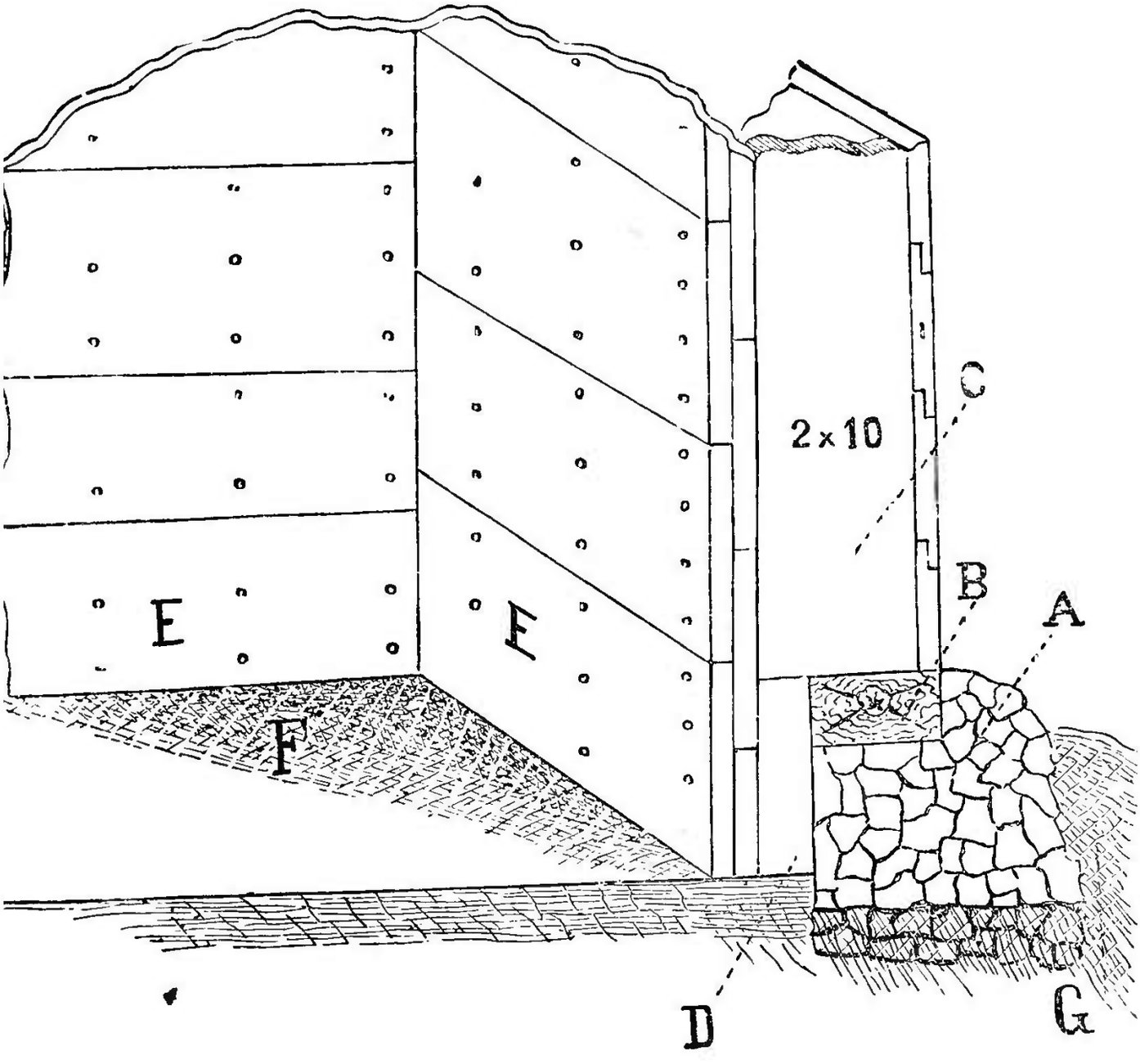


Fig. 1. Foundation of Silo with Stone.

(SEE PAGE 16.)

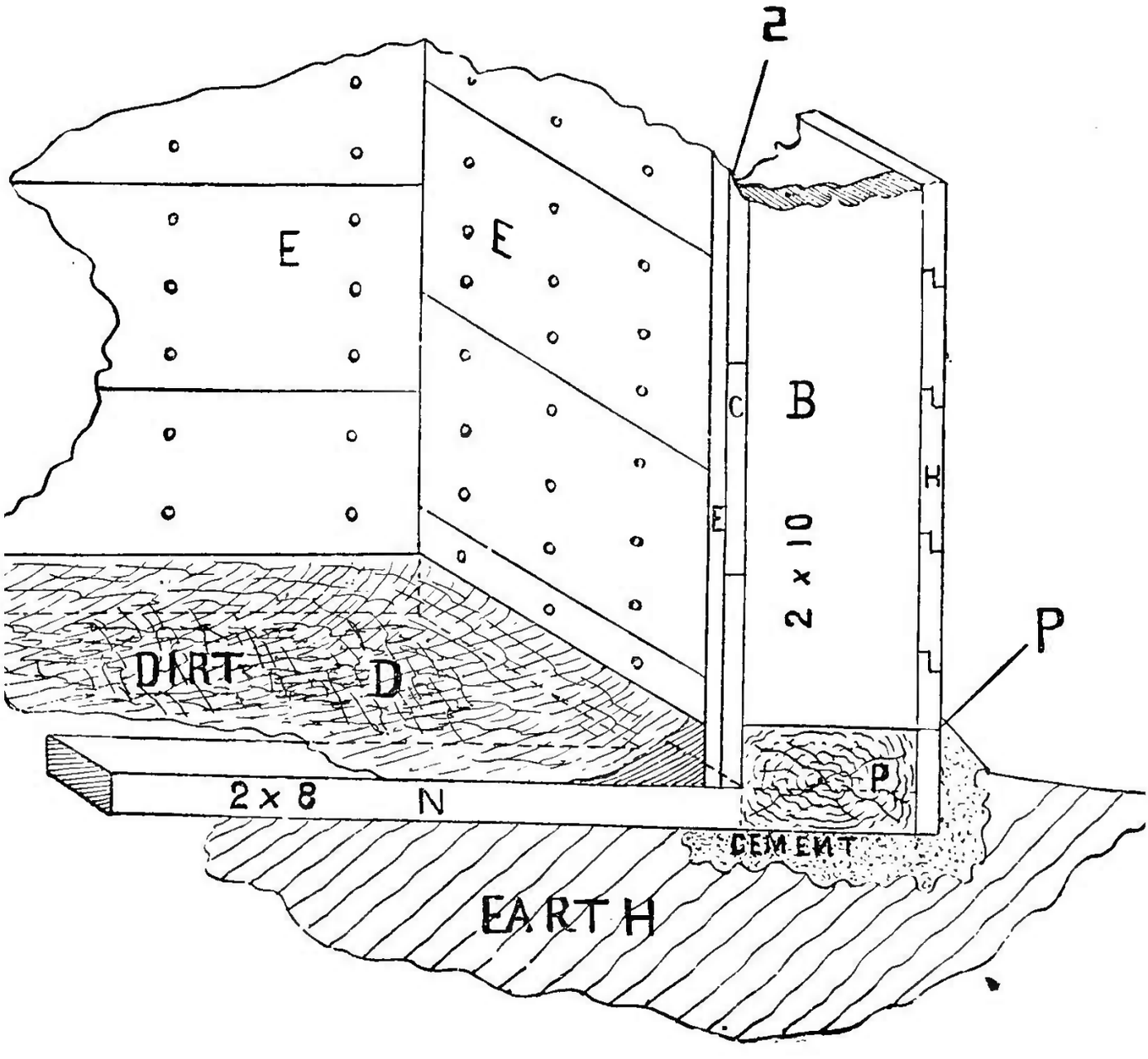


Fig. 2. Foundation showing Silo Bedded in Cement.

(SEE PAGE 19.)

with the paper and first course, to the studding. The whole interior is then painted with gas tar reduced with gasoline, and in three days is ready to receive the silage. The lumber for such a silo is better not to be matched, the straight edges being preferable.

THE SINGLE CEILED SILO differs in no respect from this (Fig. 1) save that only one course of boards is used, (in this case tongued and grooved), and no tarred paper, as paper is useless in making an air proof wall unless nailed in between two boards. The ceiling is put on, grooves up, instead of the tongues, and as each layer of lumber is added and nailed, the grooves are filled with thick paint, or gas tar, and the next board is put on, and the tongue crowded down into the paint and so prevents all moisture from getting in and injuring the matching.

Fig 2 shows a silo built without any stone foundation. The gas tar painted sill P is laid in a trench filled in with cement mortar which, when it sets, makes a foundation that cannot spring out, and if precautions are taken against surface water, there is no reason why such a foundation will not last for years. The cross sill "N" shown is not really necessary, as the walls at the base are as firm as the ground in which they are bedded.

IN ALL SILOS, the round kettle bottom or concave floor in the center, at least 15 to 18 inches below the top of the sills is superior to the perfectly level angle floor. After the silo is completed and painted on the inside, draw the dirt from the center of the silo and pack it solidly against the walls at least eight inches above the sills as shown in Fig. 2. The great pressure of the silage at the bottom is then concentrated into this depression, and the concave shape of the floor holds it and relieves the angles and corners of the silo greatly as compared with one with a level floor. The writer of this has such floors in his silos and finds them a great advantage, showing no tendency to spring out at the sills, and as to the preservation of the contents at the floor, it is fully equal to the cement floor, with the chances of the lower strata of silage next to the clay, coming out with fewer traces of acid.

Fig. 3 shows the section of a truss roof that acts as a combined roof and frame, and at the same time holds the tops of the studding from springing outward, and does away with cross rods, provided good substantial studding is used. With this form of rafter, no plate is used. the rafters K K being spiked to the tops of the studding. The cross ties L L are usually 1x8 inch stuff. They should be well nailed to the reverse side of the stud that supports the rafter, and if nailed as depicted in the sketch, will easily crosstie studding 18 and 20 feet long, and pits of equal width.

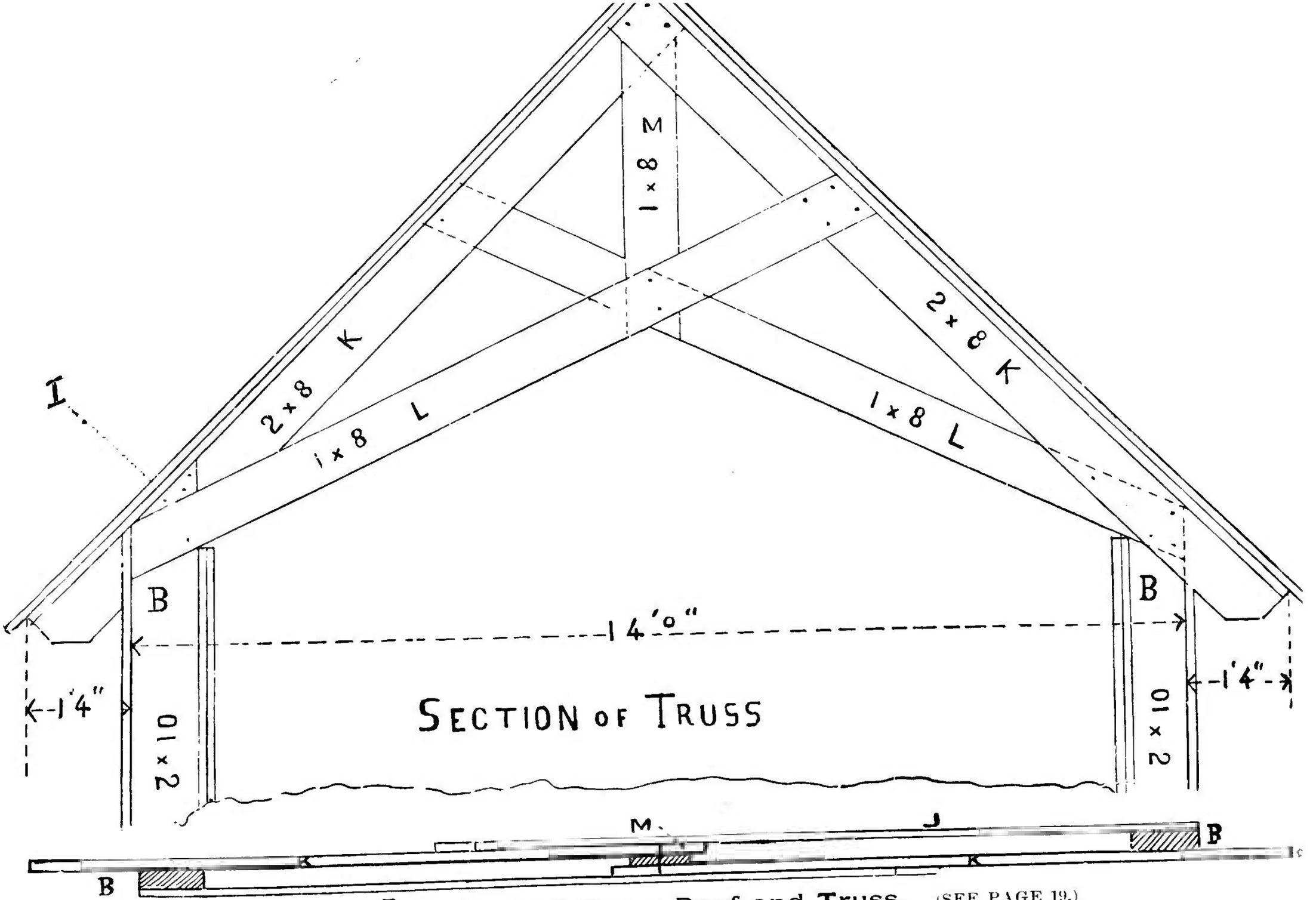


Fig. 3. Section of Truss Roof and Truss. (SEE PAGE 19.)

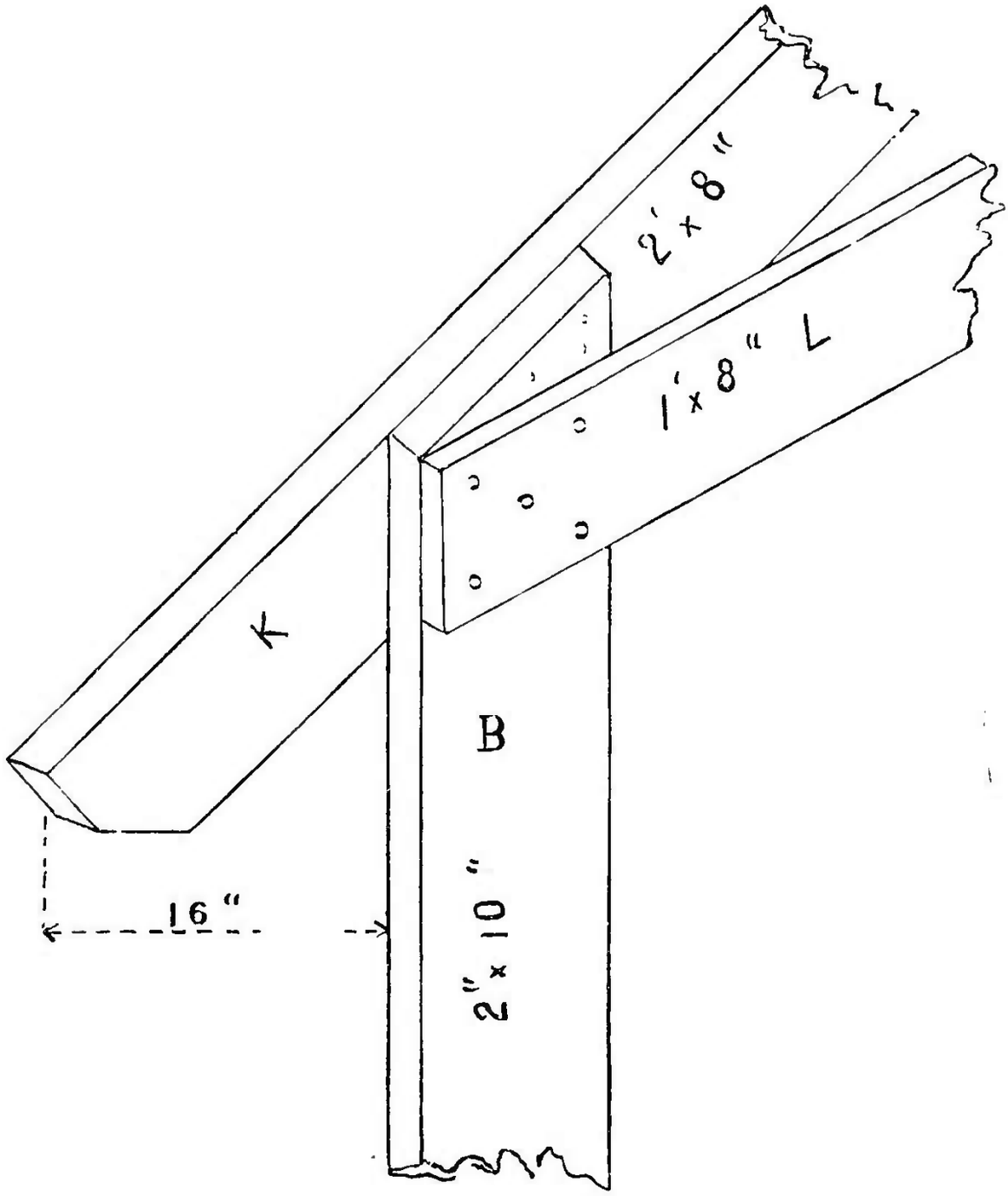


FIG. 4. Showing How Rafters are Spiked.

(SEE PAGE 22.)

Fig. 4 gives a larger view of the heel of the rafter, crosstie and method of combining the three by the means of 20 d. wire nails.

Fig. 5 is almost self explanatory, representing as it does, the deep silo built in the bay of the barn, commencing on the basement floor. The silo is based upon mud sills "C" trenched into the soil about eight inches. In most basement barns, the wall projects inwardly some six or eight inches. This is overcome by putting in false girts "E. E." crossing ends at the post G. The up and down studding can be of 2x6 inch stuff, toe nailed on "C." On the wall sides, it is quite as well to lay the studding flatways against the stone work, painting them well on both sides with gas tar, and save six inches of space. The soil in the center is dug out concave and raised along the sides as seen at I. I. The brace L. is not essential, but does no harm. Where there is danger of rats, it is possibly well to make the slope I. of cement and fine stone, but with gas tar painted sills, the writer has never known a rat to molest the silo. The double line K. K. is to represent a portion of the silo not shown, the idea being to show fully the corners and bracing, the complete silo having at least seven more studs upon the right-hand side. The balance of the sketch will be readily understood.

Fig. 6, A LATH AND PLASTERED SILO, is shown and differs in no essential from others, only that the inside lining is of grooved boarding or patent lath, which is much stronger and better in every way than ordinary small lath. If common laths are used, the bevel ones should be selected, so that "lining out" will not be necessary, and yet afford a good clinch for the plaster, and they should also be put on bias, the lath all crossing the sheating at a 30° slant so as to cross the cracks of the boards and lessen the danger of cracking the cement plaster. The mortar should always be of best cement for if it is not No. 1 it will prove to have no lasting qualities. There should be extra precautions taken in making the frame strong so that there can be no springing of the silo. A springing of the walls that is of no consequence in a wooden ceiled silo, is of lasting damage to the plastered one. If the silo is to be built out as a separate building, the studding should be of 2x10, or if very deep, 2x12 inch stuff set 18 inches from center to center and roof as shown by Fig 4.

Fig. 7 shows the best door yet devised for a silo, and made of the silo material, with no framing, or close carpenter work. The sketch is an interior view of the silo. After the silo is ready to paint, cut out the door by commencing about three feet from the top, so as not to impair

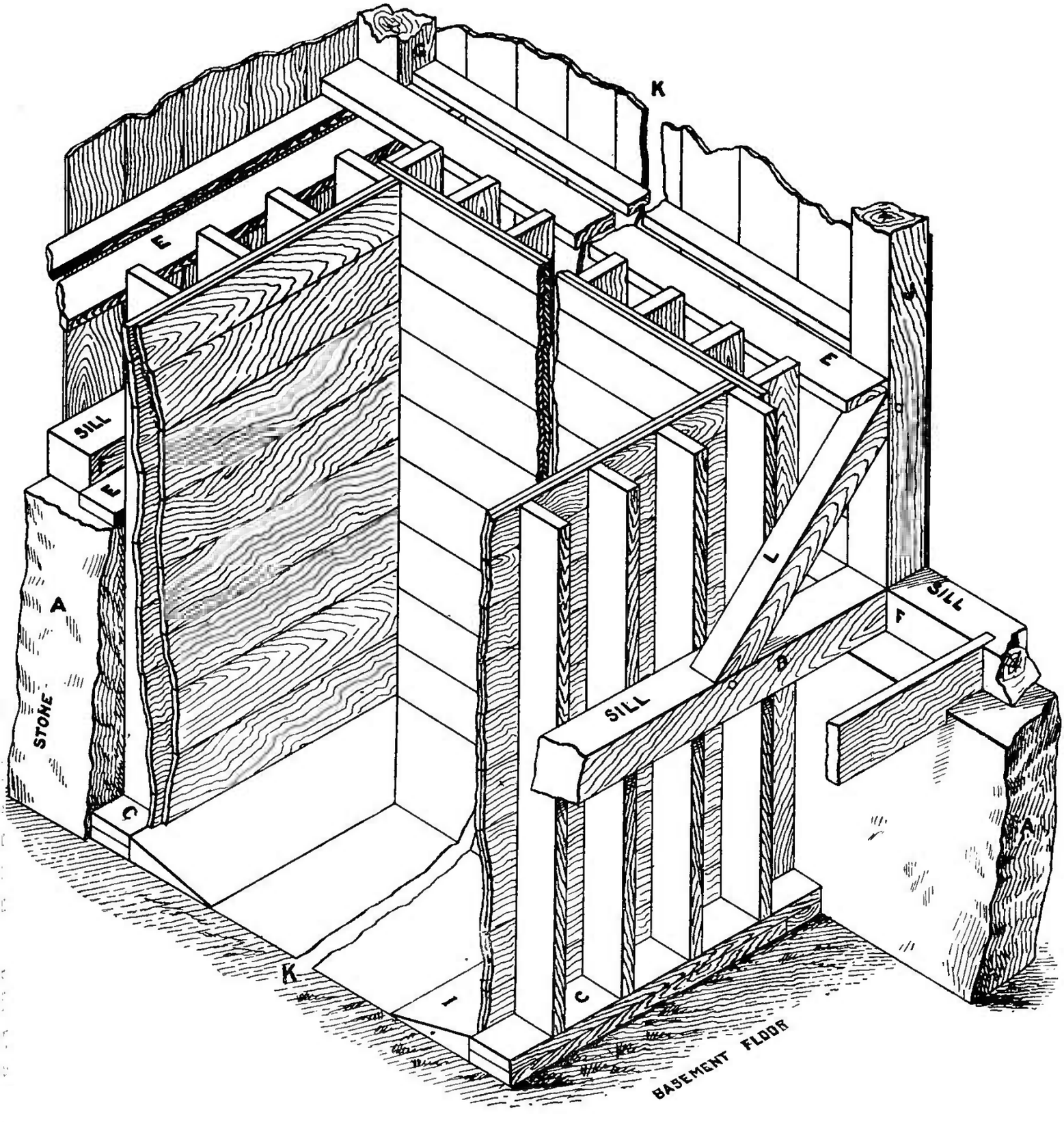


Fig. 5. Deep Silo in Bay of Barn.

(SEE PAGE 22,)

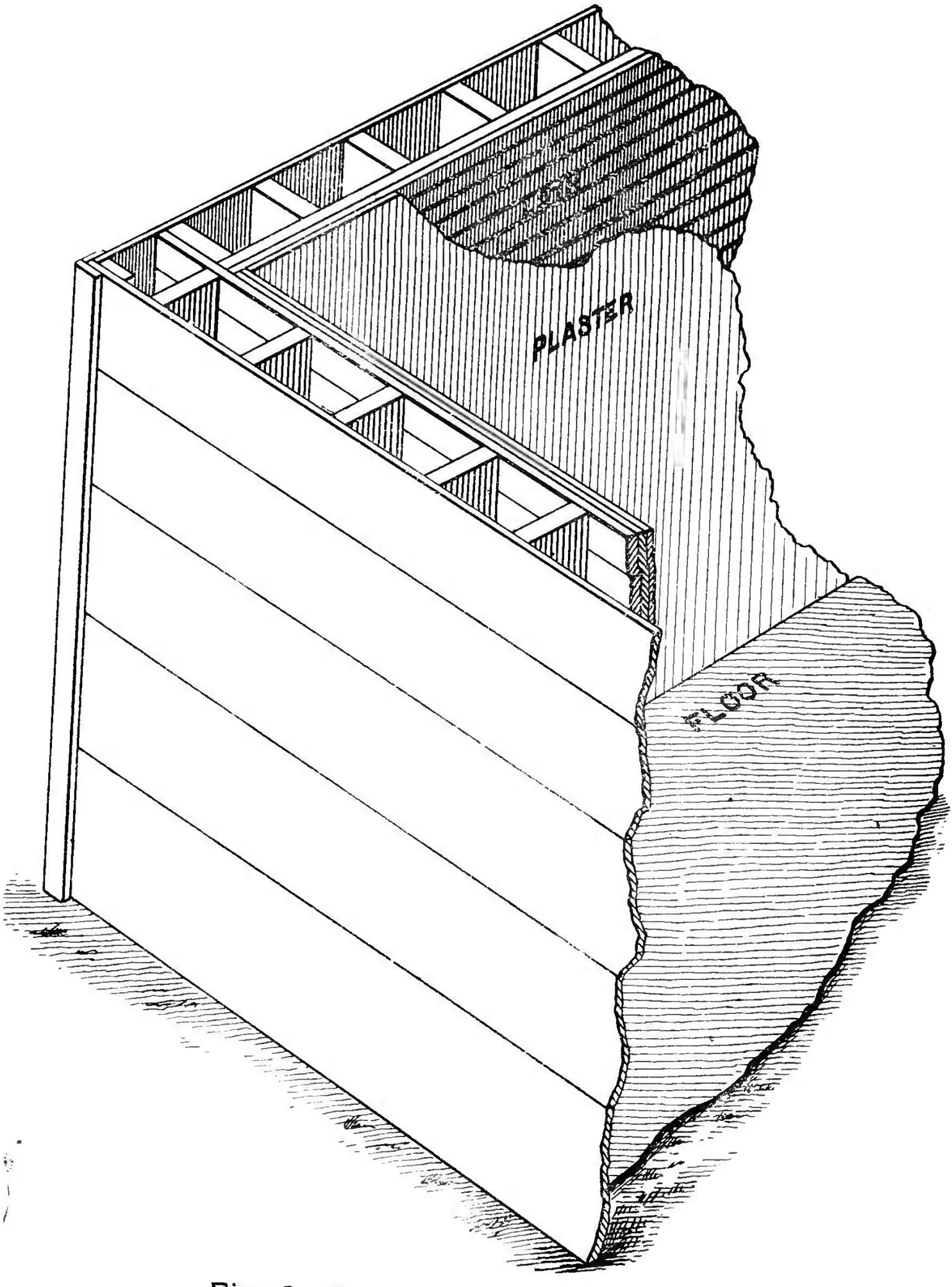


Fig. 6. Lath and Plastered Silo.

(SEE PAGE 22.)

the strength of the building, and saw down between the two studs A and B and close to them on each inner side. If the silo is 20 feet deep, saw down seven feet, skip three feet, and start in another door at this distance below the other, and saw down another seven feet, leaving three feet of unbroken wall at the center and bottom for strength. Save all these short boards "D", and number them in the order in which they were sawed out. Then nail on a board 1x6 inches to each of the sides of these studs A and B as seen at C. in the door way. This makes the door jambs. Put the boards D. all back in their places, with a 2-inch lap to prevent a double crack, fasten them lightly in their places with two shingle nails to the board. When all are in place, hang a strip of tarred paper over the door as indicated by the dotted line E. about the door, and the door is complete. The pressure of the silage against the paper and door will make it absolutely air tight, and the silage will keep as well and sound against the door as any part of the silo. In feeding out the silage, the door is opened one board at a time at the top as the silage is being lowered, and all up hill pitching of the silage is avoided.

Fig. 8 is a plan of a silo frame in an old barn where there is no foundation except stone blocking under the sills at distances of 12 to 15 feet. It is often difficult to put a grout wall under such a barn, to fill up with under the sill. If it cannot be readily done, a mud sill E. say 6x8 is painted with gas tar, and sunk in a trench its size, in the bottom of which a sewer pipe L. is placed; short 2x10 studding, shouldered at each end as seen by A. and put in place, 18 inches apart and toe nailed to both sills. The upper studding B. are also shouldered to the sill D. and false girts are put on at C., to bring out the 2x6 studding flush with A. The silo is then single ceiled, or double boarded as the builder may choose; then paint, and put in concave or cement floor as may be desired.

Fig. 9 gives a plan of an out-door silo building without stone foundation. The sill A. say 6x8 is trenched and well-tramped or filled about with mortar as shown in Fig. 2. The top is then well-tarred and two, 2x8 inch plank "B", are spiked on with corners crossed to make them secure. The studding 2x10 "C" is shouldered on the spur "D" coming down so as to be nailed to the sill "A" and tie all together.

Fig. 10 shows the corners of a wooden silo, and how to build so as to prevent spreading or opening at the corners. The studs A. and E. are set back from the corner of the sills as shown. The first lining

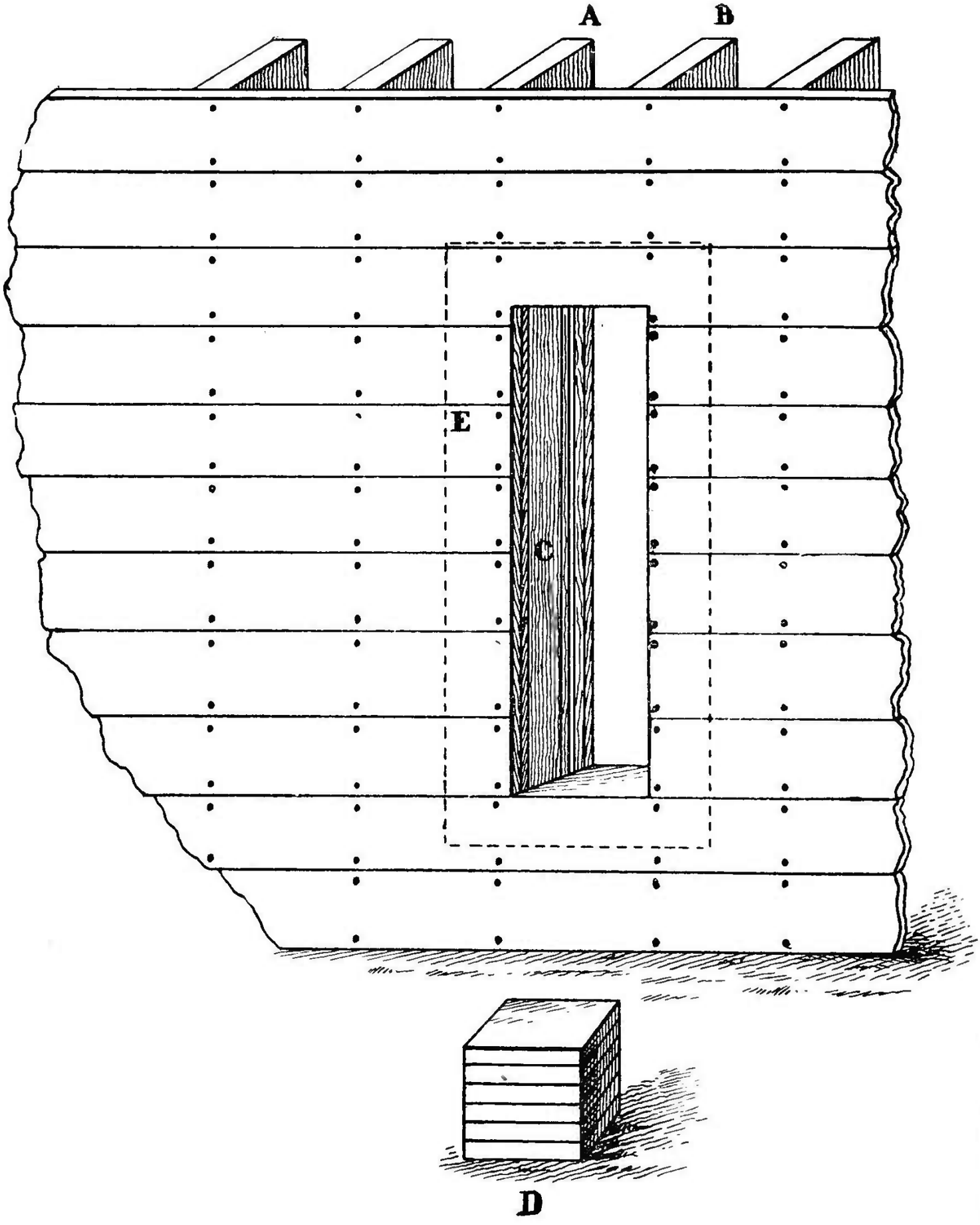


Fig. 7 Simple Plan of Door for Silo.

(SEE PAGE 22.)

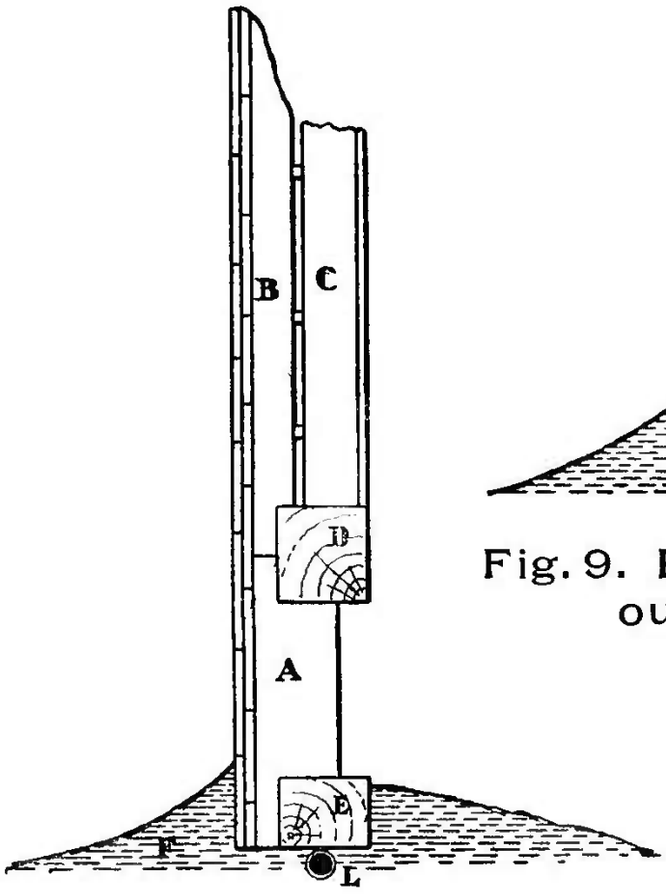


Fig. 8. Plan of Silo Frame in Barn.

(SEE PAGE 25.)

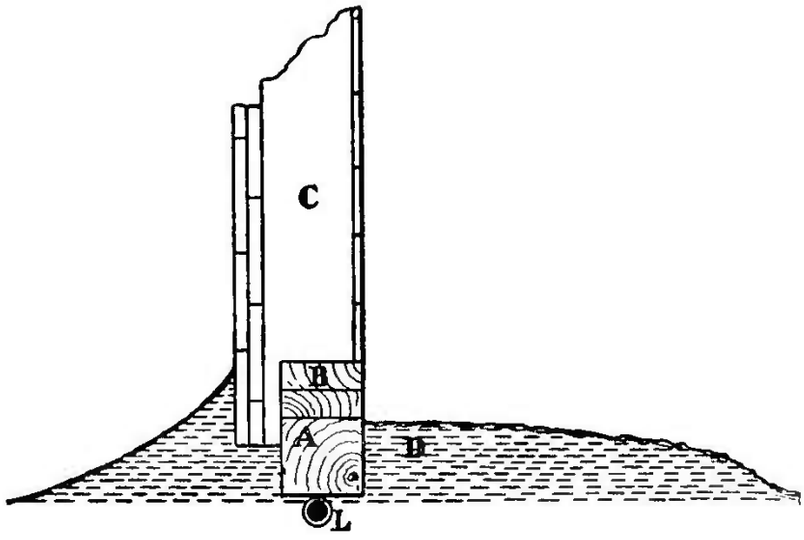


Fig. 9. Plan of Out-door Silo without Stone Foundation.

(SEE PAGE 25.)

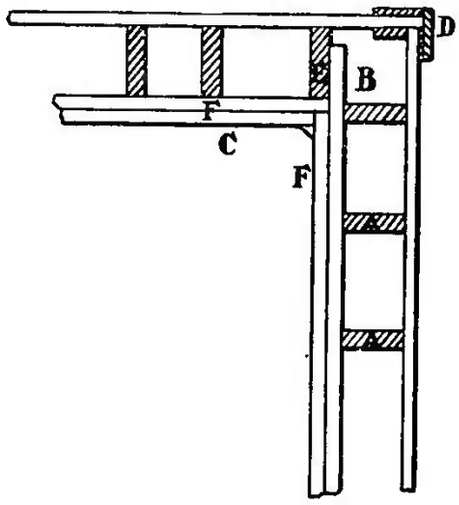


Fig. 10. Corner of a Wooden Silo.

(SEE PAGE 25.)

board B runs past A and laps well on the stud E., and is securely nailed to both. The opposite board F. is squared, and runs into the angle and is well nailed to E. If the boards are all of one width, they may be reversed, B. first lapping on E., and then F. on A. When the first sheathing is on it would be good policy to paint it with the water-proof paint, then put on the paper, which is best if put on up and down, well lapped, at least two inches. The second lining is then cut and nailed in. This second lining is as seen in Fig. 10, cut to fill the corners. If some 16 d. wire nails are used, the board C. can be nailed to the stud E. to hold, while a 10 d. nail will fasten to the stud A. A. The paint is then put on and then a cornered strip is nailed in the corner, which should first have a liberal coat of gas tar put in the angle and this triangle strip nailed in. In building, the board B. will be angled into the next corner the same as F shown in Fig. 10.

Fig. 11 shows yet another plan of frame, and in some sections is regarded as all right in every respect, and was invented we believe by the Hon. Geo. T. Powell, of Ghent, N. Y. The foundation consists of sills A., 8x8 or 8x10 inches. The ribs B. B. B. are 2x6 inches and are put on each 18 inches. The inside is lined up with inch boards on which paper is put, and a second lining put on over. In a barn when the frame was regarded as very weak, such a silo would be wholly independent of it. The sketch is largely self explanatory. For an out-door silo it would be strong, and easily constructed.

Fig. 12 gives the plan of a ROUND SILO that is most warmly commended in many quarters. The round silo admits of many variations, and no two are exactly alike, as noticed from published reports. One kind much recommended is the tank silo built of 2x6 inch staves hooked with iron bands with lug irons so that the tank may be tightened up, should it shrink. The other form is the one here illustrated by a sectional, interior view. It can be built either with or without a stone or brick foundation. If on brick, as here shown, the studding 2x4 are set 16 inches apart upon the wall and stayed. It is then hooped, "D", by putting three or four springy boards around the outside, a layer at a time, and nailing to the studs, each layer being put on with a good lap. The silo is then lined up inside by using lumber one-half inch thick and eight inches wide, put on round and round. It is then papered and a second lining put on with a half lap, so that the cracks in the first and second layer of boards will not be nearer than four inches The silage is thrown out by making man holes in the walls 16x24 inches,

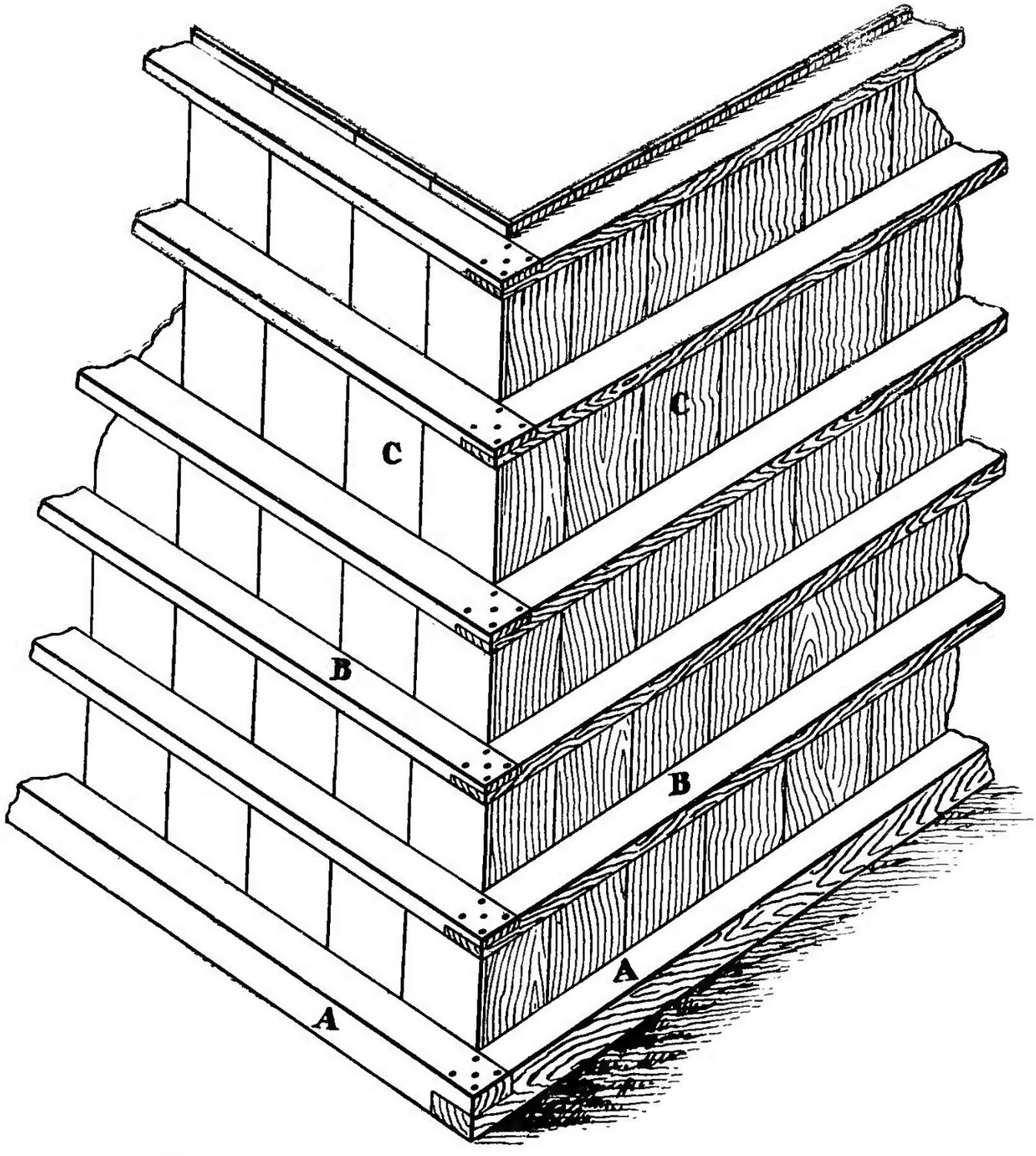


Fig. 11. New Style of Silo Frame.

(SEE PAGE 28.)

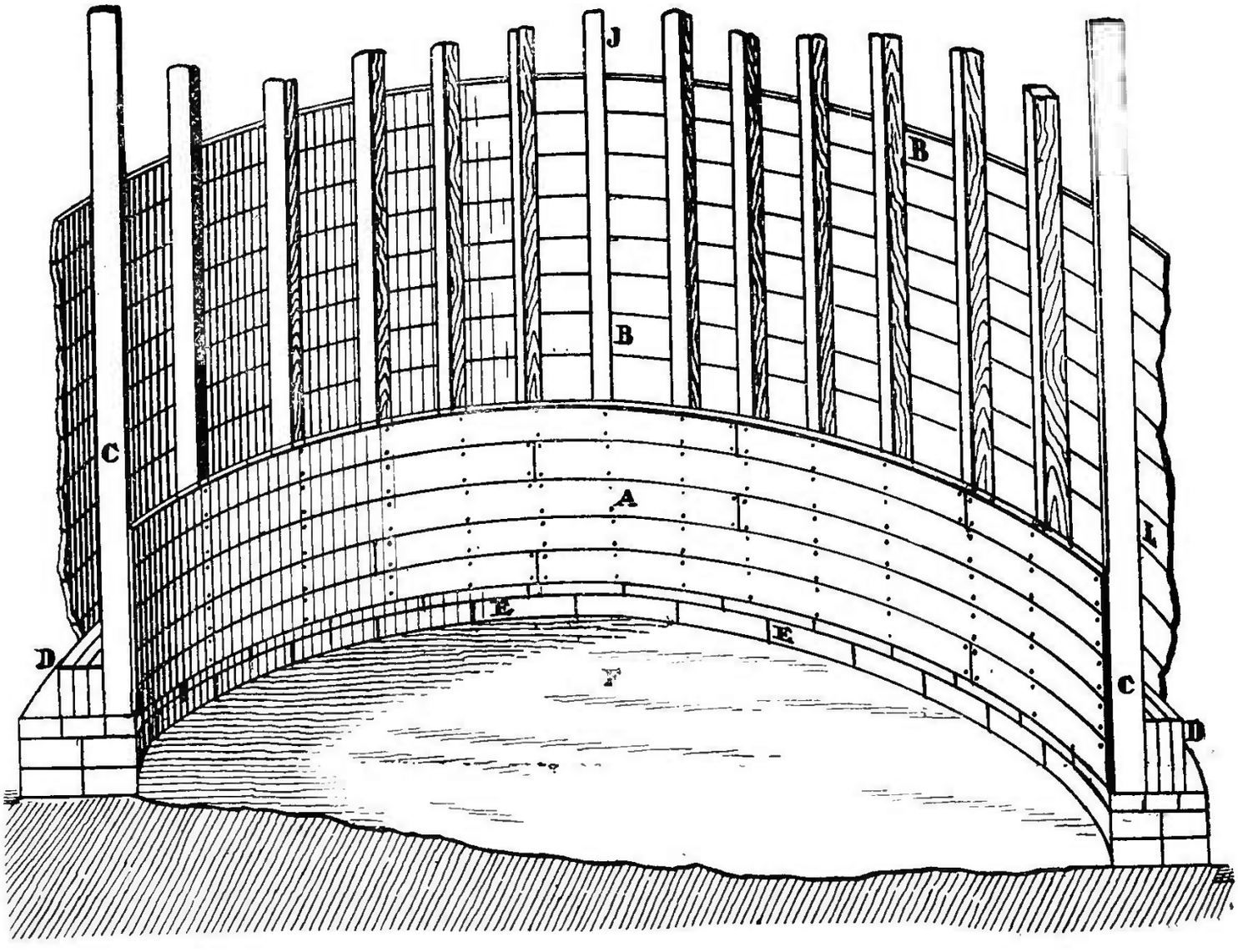


Fig. 12. Plan of Round Silo.

(SEE PAGE 28.)

and a door made on the same plan as Fig. 7. Some vary the horizontal boarding by putting it on bias, starting a board at J. and ending with it at L. which by some is thought to possess superior advantages over horizontal boarding.

These figures in the main cover the ground of silo building. They are not iron clad in direction, but can be modified or enlarged upon, as the conditions or circumstances may warrant or dictate. N. B.—A fairly strong structure and one with walls *absolutely* air tight, and so built that air will not come up from under them, is essential in all. That a silo is good because it cost $500, is no proof that it will outlast, and out perform one holding as much, and costing less than $100. A cheap silo need not per force be a defective one, as cheap things are not always a delusion.

The cost of silos must vary with locations and conditions as the pages of this book readily testify. If the silo can be built in the barn, and good, fair, sound lumber be bought for from $8.00 to $10.00 per M. and good studding at $12 and $14 per M. there is no reason why a 100 ton silo cannot be built complete for $50 or less. The writer of this speaks from knowledge upon this point. Others fearing that sound, cheap lumber will not last as well as more expensive material, will have no difficulty in making a silo cost $100 of like size. Prof. Cook, who is excellent authority, puts the cost of his lathed and plastered silo at about $1.75 per ton storage capacity. The stone and grout silo must needs have the estimate of the local mason or contractor. The item of making ready has something to do with the cost. That the silo of the future will cost less, be less defensive against air and water, is wholly improbable. It may be possible that the silo of the future will be made of steel, with close joints and with rust proof protection, but that it will fill the requirements much better than the wooden silo, must remain a conjecture unless perchance some new scheme should be invented for the preservation of silage, when all plans may be changed and a new system adopted. It may be that a microbe killer will be brought out, that sprinkled on the fresh cut silage will keep it free from all ferment, and not prove injurious, but shown to be actually beneficial to the stock. But both of these ideas are in the "dim distance" and the purpose of this book is to instruct in the ways that are known and proven, and to this end the practical thought and experience of the silo men of 1889–'90 are given full countenance and credence.

BILL OF LUMBER FOR A 100 TON SILO INSIDE OF A BARN.

2,660 feet lumber 1x10 or 12 inch, $8.00 per M,.....	$21 00
900 feet studding 6x2, 22 feet long, $10.00 per M.....	9 00
4 sills 8x10 inch, 16 feet long,.....	2 00
1 keg 10 d. wire nails,.....	2 25
3 rolls tarred paper,.....	4 05
8 gallons gas tar,.....	25
5 " gasoline, ...	50
Surfacing lumber,.....	2 50
Carpenter, three days, say at $2.50,.....	7 50
Total.....	$49 05

The lumber is all right, if good $8.00 per M. hemlock or oak can be secured. If not, sound pine cull boards are as good, all widths not below eight inches. On this base, lumber $8.00 per M., studding $10 per M., the bills foots up as above. If the silo is out of doors, roofing and single siding must be added to the amount stated, and would be about as follows:

3240 feet siding, $16 per M,.....	$51 84
200 " rafters 2x6, 12 feet long at $10 per M,.....	2 00
110 " brace rafters, 1x8 inches, 12 ft long, at $12 per M.	1 10
400 " roofing boards, inch culls at $8 per M,.....	3 20
96 " 4 corner sticks, 4x4 inches, at $10 per M,.....	96
60 " 8 " boards, 1x4 inches, at $8 per M,.....	48
115 " cornish boards at $8 per M,.....	92
5 000 shingles nails, &c., say,.....	13 50
Additional labor, say,.....	7 50
Total, ...	$81 50

Making for an out door 100 ton silo, say $130. If a stone foundation is used, it will require about 12 perch of concrete stone wall, needing probably four or five barrels of cement at $1.10 per barrel, together with the mason's work added at local labor rates. If built outside, the silo is best not to exceed 20 feet deep, and the studding instead of 2x6, should be 2x10, adding somewhat to the lumber bill. The outdoor silo is best proportioned when built as a separate building, to be about 22

feet long and 18 feet high. The first bill given was that of the writer's silo built in a barn 16x16, and 22 feet deep. The larger silo with less height, takes practically the same lumber to the 1,000 cubic feet, storage capacity.

WABASH, IND., Dec. 24, 1889.

THE E. W. Ross Co.,

Dear Sirs:—We have used the No. 14 A Cutter steadily ever since we purchased it of you without having to stop a minute for anything. In one hour we can cut enough hay, straw and fodder with it to feed 40 milch cows and ten horses one week, while our neighbors who have the Belle City, Tornado, Ohio and Smalley, take a whole day to cut enough fodder to last 30 cows a week. The Ross Cutter cuts the fastest, and makes the cleanest cut with the least power of any Cutter ever brought to this county, and we pronounce it the best Cutter made.

Yours Respectfully,

D. G. BLAYNEY

GOVERNOR W. D. HOARD,

Of Wisconsin.

Founder and Editor of "HOARD'S DAIRYMAN," a most reliable authority on the question of dairy cattle, and a strong advocate of ensilage.

A SILAGE RESUME.

That silage will "have its run like all other new fangled ideas, and disappear as quickly," is a rarely expressed assertion in the year 1890, and that the silo is now an accepted fact in our agricultural economy, none dispute. The silage problem is one most discussed at club, institute, and farmers meeting. The agricultural paper without its silage literature, can have but little success as a general purpose farm journal. The time devoted to the discussion of silage at the Institute and Club is not used to advocate nor to boom it, but to present its real merits and results obtained. State Societies, Dairymen's Conventions, and Stock Breeders' Associations, and even special Silo Congresses, meet to discuss this subject with its yearly improvements and new discoveries, as they would a revelation that promised lasting peace and prosperity.

THE ADVANTAGES OF THE SILO are not advocated by a few silo enthusiasts, and a baker's dozen of venturesome farmers, but the Station Directors, Professors, Men of Science, Specialists, farmers and even political economists like Edward Atkinson, and others, now are all friends and advocates of the new food for stock. Men of great chemical attainments like Dr. Manly Miles, Prof. Woll, Goesseman and others, are making profound researches as to the character of the various food changes that take place during the process of silage making. They are also comparing the changes that go on day by day in the silo with similar food dried, noting its changes by the action of air, weather and kindred influences. Formerly medical men and health officers kept a close watch upon cows fed on silage, noting the influences of silage upon the health of the stock, and upon the quantity and quality of milk produced. Also whether there was an increase of disease and minor troubles among people who consumed silage made milk. The market man who handled silage, made butter and cheese, had his fears also at the start; but out of each and all of these investigations the feeding of silage has more

than held its own. For the past five years silos have "multiplied upon the face of the earth" with astonishing rapidity, and with great satisfaction at the creditable results obtained. It will be seen by the testimony offered farther along in this book, that many a farmer now expresses himself, "I could not longer profitably farm without a silo."

WHY THIS DEMAND FOR A SILO? Why this earnest inquiry as to its merits? Why all this talk, discussion, literature, and conferenee? There is but one answer; the farmer sees the economic changes that are assisting and effecting other industries, and realizes that corresponding improvement, advancement, and economy are necessary to the suecess of the farm. The demand now is for a cheaper, perfeeted article of produce, whether it be animal, or finished food product like pork, milk, butter, cheese, or choice lambs and improved mutton. Maximum results in such products were not attainable with a minimum outlay of labor and expense until the silo eame to the farmers assistanee. The farm generally speaking, is not eentralizing its efforts. There is a partial cultivation of too much territory. An equal amount of labor ean produce better results and larger returns when bestowed on a smaller but well cultivated acreage, and made correspondingly cheaper. Too many of the crops are raised for the grain only, the residue being thrown away. Millions of aeres of eorn are raised for the grain, and stalks suffered to waste in the fields, giving no adequate returns. The silo came to solve some of these questions. It presented a quick, eeonomical way of saving a big crop with the least possible waste, by the cheapest possible method desired. It did more, for it put the crop away undivided, to be fed later on with no needed mechanical ageney to better prepare it for the stock, thus crowding the labors of a winter into a few days. The food when once "boxed," remains as near its original estate as possible, with only a fraetional waste in the food elements, and presented to the eattle in a eondition analagous to summer feed a food so acted upon that it is digested with the least possible expenditure of animal force, quite as easily as grass, and produeing an effeet not greatly different from it.

THE EVOLUTION OF THE SILO, from a building of rock walls and of barrels upon barrels of cement, to a wooden building of balloon frame, has made the silo a possibility on every farm. The wooden silo may possibly have lath and plastered walls, but nine times out of ten it will have a wooden wall protected with a cheap water proof paint made from gas tar. Where the silo formerly eost one or two thousand dollars, it is now

built at an outlay of only $50 or $100, and a receptacle for silage constructed that has properties for preserving silage superior to the other and more expensive one, which fact has had a wonderful influence in promoting the growth of the Silo. Many a man, can, by means of the Silo cheaply yet well built, see how he has doubled the animals upon his farm, economized upon extra crops he was forced in the past to feed, but can now save and sell, thereby increasing the farm revenues to a large extent. At the same time he can preserve and add to the stores of fertility that make rich the soil, and increase the farm crops, in proportion as they are saved and applied, or neglected and lost. Not that there is magic creation about it, but there is that in it that enables a farmer to more nearly save all of the rank growing crops upon the farm, like corn and clover, and feed them to his cattle in the winter so green and full of their natural juices, that with a warm stable, the farmer may have substantially 365 days of continual summer production upon his farm at minimum expense.

THAT A FEW HAVE NOT SUCCEEDED well in silo adventure is true, but this class is but a fraction of the whole, and exceedingly small in number as compared with those who have succeeded. Each year there thousands of farmers in the United States who are unfortunate with their wheat, potatoes, hay and clover, but no one argues for this reason that none of these things can be successfully raised by the general farmer. Not one farmer in one hundred fails with ensilage, and this one failure nine times out of ten is caused either by a defective silo, a crop not in condition to ensilage, or neglect of the necessary methods in harvesting and preserving the silage crops. That those who have practiced a fairly conservative course in the preparation and use of silage, have succeeded, and succeeded well, is not denied, and this success is proved beyond question by a cloud of witnesses. Every state and territory in the Union has its silos. These silos contain corn, clover, oats, cow-peas, rye, and in the South, sorghum, and even now Teosinte is recommended as the crop of all crops for the Gulf States. All this indicates that the silo is a fixed fact in our American agriculture, and that farmers here and there realize that the farm revenues must be increased either by increased production, or increased economy, or by both. Silage is the system both of increased production, and increased saving, and possesses the means of utilizing both at the smallest outlay.

IN ALL THIS PROGRESS, and in the buildings of tens of thousands of silos, of every variety and under all circumstances, there must, with

our yankee inventive skill, be substantial progress made. The writer has been identified with the silo, and ensilage for many years; and has had occasion to investigate the silo and its contents in almost every section, has heard and sifted the opinions of hundreds of farmers, and to the information thus obtained, has been added that more certain knowledge secured by practical, personal experience upon the farm, learned by careful, studious application and repeated experiment. With this Monitor of experience to aid, only the thoroughly practical and trustworthy information is made the subject matter of this Resume.

THE SILO.

Now that the stone silo seems to have had its day, and so good an authority as Prof. W. A Henry says it is a "mistake to continue to build them", the other styles of silos have called out many plans and details embodying much variety. There are many people who advocate the round silo, but in the main they are all boxes of square or oblong form; a few also have been built after the tank style. The wooden silo seems to be the one generally built, probably in nine cases out of ten, and although it was at first claimed that the wooden silo would not prove durable, the results have proven the contrary. In some instances the well-built, wooden silo, has already seen its stone rival submitting to a "mason doctor" for repairs, and not unfrequently has the stone silo received a wooden inside lining to make it a better preserver of silage. The application of wood preservatives, like gas tar diluted with gasoline, have made the wooden silo durable beyond question. While the stone or brick silos were the "original packages" for silage, the preserving qualities except in rare instances, were not satisfactory. But a stone silo "studded" up inside with 2x4's and lined up with lumber, immediately becomes a good silo, as for instance the now noted University Silo at Madison, Wis., being proof in point, which is substantiated by much proof from other sources. (See Dr. Miles' "Silo and Silage").

ONE OF THE FIRST ADVANCES was the wooden silo with a lining of lath and plaster, that proved a great improvement over the all stone silo, and thousands of them have been built, some in almost every section. This style of silo to be durable must have a very strong timber frame so that there shall be no springing of the walls to crack the plaster. It is also found that the plaster must be made of the best of cement or it will not be air proof, resulting in damage to the silage. This trouble is now overcome by using the best of cement, plastering with two coats, and

then washing down the walls with a cement wash. In place of common lath, it is better to use the grooved siding now so much recommended, putting it on diagonally to the inside sheathing, to give additional strength and presenting less liability for the plaster to crack.

THE ALL WOOD SILO is now the one mostly built. In the beginning it was thought that only an extra good grade of lumber could be used, double-dressed and matched, making the expense very considerable. By reference to the illustrations, Fig. 1 or others, it is seen that this silo can be built of any cheap, sound lumber. Uniform width is not necessary, nor is grooving and matching. The boards, foundation timbers and the lower ends of the studding of the silo shall be well-saturated with gas tar. The inside lining boards are not of necessity even jointed, beyond the straight edging of the saw. They are put on horizontally, the edges brought together and well-nailed. When the two courses are on, with the tarred paper between them, and securely fastened to the studding with 10 d. wire nails, the finishing touch is given by a liberal coating of the diluted gas tar, which not only coats the boards rendering them water-proof, but fills up the cracks, and when the silo is filled, the moisture of the silage will close the slight seams if any remain, and the silo then becomes as air tight as a drum. A man by this plan, having $8.00 to $12.00 lumber can build a silo inside the barn for 50 cents per ton contents, as hundreds testify, the majority being pronounced in favor of the double, horizontal boarded silo.

MUCH FAVOR HAS BEEN AWARDED the single ceiled silo which is lined up with one course of good, clean, matched lumber. That those who have these silos are pleased with them is not denied from any quarter. In building it seems best to put on the siding with the grooves up, and fill each groove with thick paint before adding the next board, and when done, before putting on the outside weather boarding, thoroughly paint both sides of the boards that compose the inside lining of the silo.

THE ROUND SILO is predicted to be the coming silo, as it has no corners, and no "avenues of air" to descend and damage the silage. A noted Wisconsin man assumes that the future silo will be made of steel, like a huge oil tank.

In this book will be found a full description of the round silo, that will be of interest. A careful study of the various silo illustrations, and their descriptions in this book may enable the intending builder to select one of the most approved and economical plans, and one particular-

ly suited to his wants, or out of the several styles he may produce a combination silo that will exactly meet the long-felt want: "The silo for the average farmer, and stock-grower."

THE CROP FOR THE SILO is of great importance. The idea of the silo is to intensify farming, and this reduced to practice, is a big crop of the best material, raised on a minimum sized plat, with the least possible labor consistent with good culture. That this crop is corn, with its adjunct of clover, is not disputed. The kind of corn is a matter in controversy. The wide range of the silo carries it into localities out of the corn belt, where seasons are short and conditions not always favorable to the best growth of corn. For each locality, a particular kind is pointed out as a very suitable sort, having a growth that is in harmony with the soil and climate. From the start there has been a pronounced opinion that the white, horse-tooth corn from Virginia was the silo corn par excellence. To-day it is planted over a vast area and seems to hold its own in the natural corn belt where 120 days of fair corn weather can be reasonably counted upon. In the East, the Dent varieties are considered superior, as they grow and mature in 100 days. In the northern range of states, Central Michigan, Wisconsin above Madison, and Southern Minnesota, the best varieties of local grown corn are deemed best. Now that the principles of corn growing are better understood, good success is almost assured with the larger, ranker growing corns in any locality. It has been thoroughly demonstrated that to obtain the richest feeding qualities in the corn fodder crop, the efforts should not be expended so much toward obtaining the greatest possible weight in the crop, as toward bringing the crop to its fullest perfection, and this cannot be attained unless every effort is made to induce as large an ear growth as possible.

THE STALK THAT PRODUCES NO EAR OF GRAIN is deficient in feeding nutriments to a greater extent than would be the subtraction of the feeding value of the ear alone. The difference in favor of an experimental plat of ground where ears were abundant, and another where ears were wanting, owing to close broadcast sowing, was in dry material about 3 per cent., and in total proteine the drilled corn showed 529 lbs. and the broadcast 229 lbs. other things being equal. The successful silage field is now as thoroughly prepared as possible, and well-fertilized, clover or rye sod being superior; the best seed only being used and drilled in, the quantity not exceeding eight quarts per acre. The drills should be at least 3 feet, 6 inches apart, and the stalks not nearer than

six inches in the row, and some siloists now advocate eight and ten inches as the proper spacing in the rows.

CORN IS A SEMI TROPICAL PLANT, and to get full developement, must have an abundance of light and air, and then it grows in fertile soil to perfection, provided that in cultivation there is no disturbance of the roots during growth. To sever the roots is to retard growth, and often, if done excessively, it prevents ear formation. The corn plant to develope fully must have abundant room. Shade is fatal to corn. If the leaf does not have its full quota of sunlight, to excite the natural secretions of the stalk, it will arrest the transformation of sap into starch and sugar, by the aid of the carbonic acid gas furnished by the air.

THE SILO CALLS FOR GOOD FOOD MATERIAL, for it must not be expected to turn out a good, rich food if filled with an inferior deficient corn growth. Prof. Jenkins in his analysis found specimens of corn fodder so poor, as the result of over seeding and crowding, that they only contained 7.1 per cent of food value, while other good fodder contained as high as 48.5 per cent. It is nearly as destructive to cut corn too soon as to crowd it. The corn plant as it hastens on in its rapid growth, seems for a while to little more than build up a structure of cellular formation and sap, until the time the tassel is put out, but from then on these cells are filled with starch, sugar, proteine, fats, &c., &c., more or less of which therefore will be lost altogether if this fodder is cut before being fully developed. GOOD SILAGE therefore depends quite as much upon mature corn, or clover, as upon any other one feature of the process.

IN A LATE REPORT FROM NEW YORK, Prof. Ladd in experiments to determine the relative value of corn cut early and late, shows that an acre of fodder corn cut in the first tassel, weighed 9.02 tons gross, and contained 8.21 tons of material rated as water; whereas an acre of this same corn, similar in all respects excepting that the ears were glazed, when cut, weighed 16.14 tons and contained three and sixty three one hundredths tons of dry matter, showing that between the time the corn in the milk was cut, and the time this corn become glazed, there was an increase of two and eighty two one hundredths tons of dry food matter. By this will be seen that a cow weighing 1,000 lbs. must eat a daily ration of 300 lbs. of the first mentioned early cut silage to maintain support, and keep her in flesh. The Professor's experiment is valuable also in that he shows that the starch element between the time of the first and second cuttings of this crop, increased at the rate of 2,852 lbs. per

COL. J. H. BRIGHAM,

Delta, Ohio.

MASTER OF NATIONAL GRANGE.

acre. In the foregoing lessons of experiment, analysis and figures, it will be readily seen that to obtain good silage containing nutritive elements in the highest degree, particular varieties of corn especially adapted to the locality and climate must be planted, in order that they shall fully mature and glaze before being put into the silo; otherwise we shall loose over one-third of the value of the silage. This would be the case in planting a late variety of corn which will not mature before it is time to cut it. In this connection it may be well to remark that there is nothing gained by planting sweet corn in expectation of obtaining a greater quantity of nutritive matter, and an excess of sugar. Prof. Manly Miles says that "the sweet corns have no marked advantages. The yield is less and there is no evidence that they possess higher feeding qualities." The writer from observation has found those who fed sweet corn ensilage during the past year, complained of an unusual acid tendency in their silage, and they will discard it for other varieties hereafter. Prof. Ebberman of Minnesota thinks this tendency toward excessive acidity is due to the characteristics of the saccharine element in the sweet corn ensilage which differs from the sugar of the Dent varieties.

IN MANY CASES where entire success in raising the large Southern corn has not been attained, the trouble was either in too thick seeding, too deep cultivation or too early cutting, or possibly all of these causes. To get the best results the corn plant must be made to work to its full capacity and not be restricted in any of its functions or means of developement, and suffered to grow until nature has completed its work, and then when in its best estate, it should be cut and properly put into the silo.

THERE NOW SEEMS TO BE LITTLE DOUBT that the corn crop can be cultivated with great economy by the use of proper working machinery; light slanting harrows, vibrating weeders, and the shallow running cultivators. The object of cultivation is to prevent weed growth and to prevent the soil from crusting. Cultivation adds nothing in the way of fertility, and only so much should be done as will keep the weeds down, and the soil from crusting. Root pruning should be carefully avoided. One and one-half inches is as deep as any cultivator should be allowed to run between the corn rows and the soil should be displaced as little, and be kept as level as can be done, consistent with proper cultivation.

THE METHOD OF FILLING THE SILO, has become a science, re-

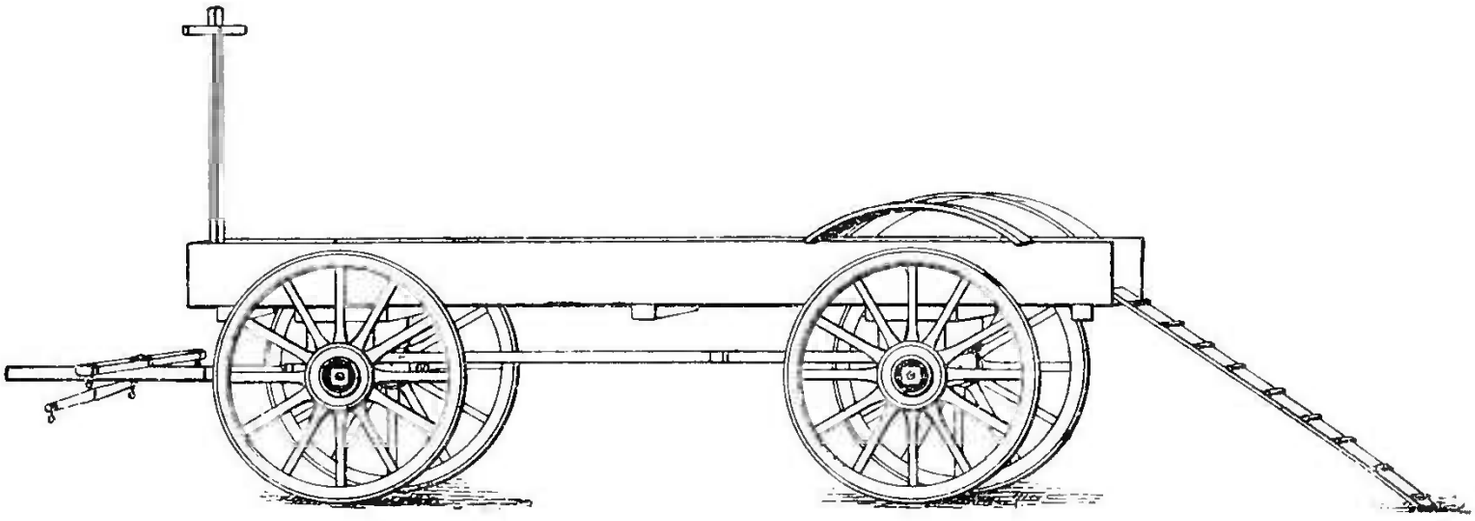


Fig. 13. Wagon with Rack and Trail Board.

(SEE PAGE 15.)

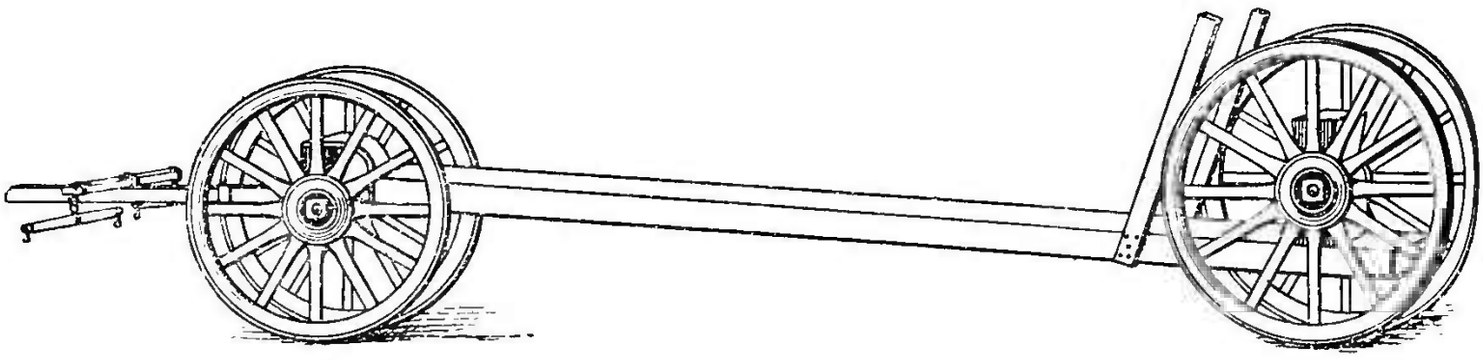


Fig. 14. Wagon with Low Swung Rack.

(SEE PAGE 15.)

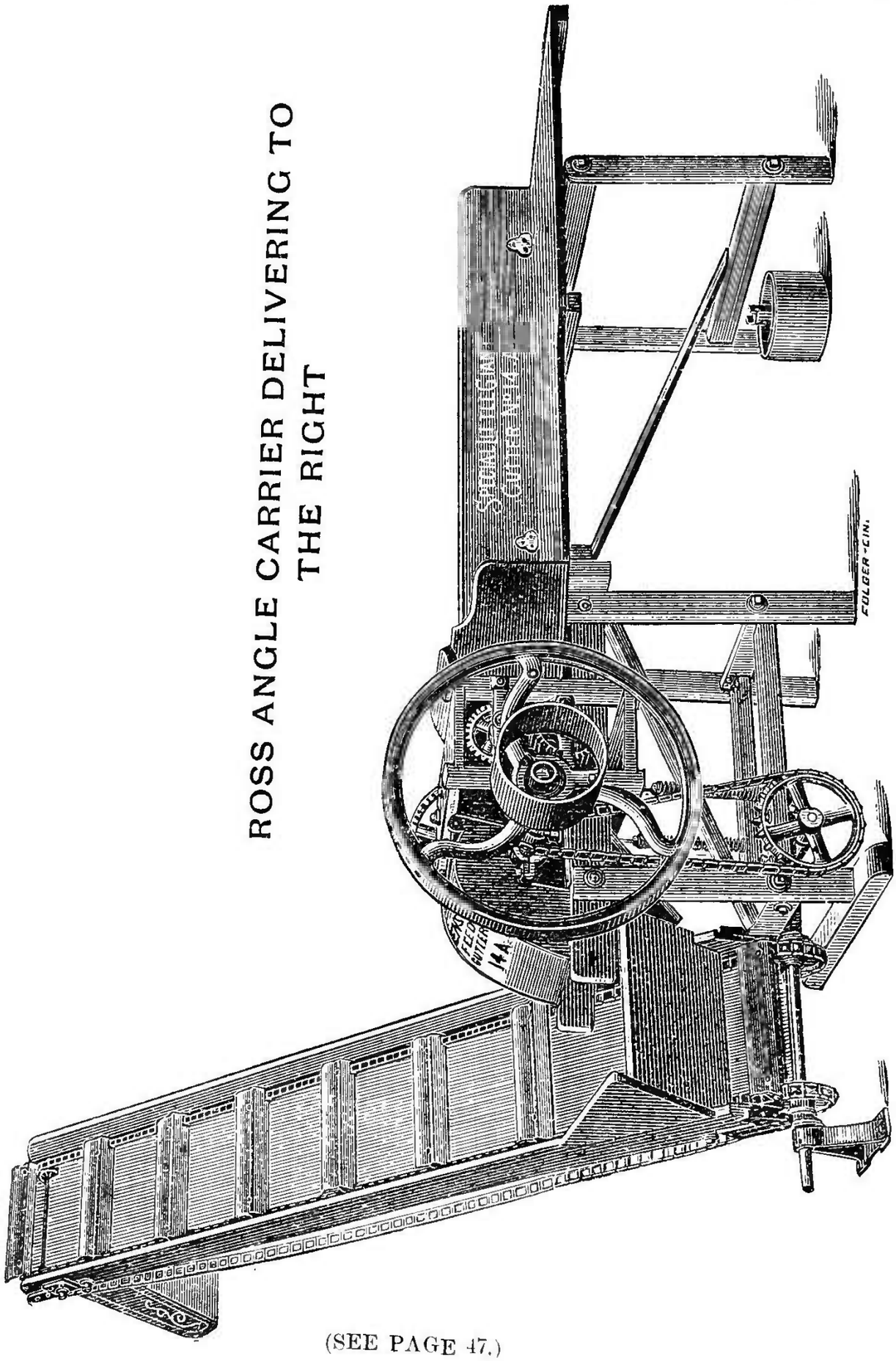
sulting in a great saving of labor in the fields, in transportation and about the Cutter and Silo, as will be seen by comparing the present methods with those in vogue half a dozen years ago. The army of men and teams formerly required to harvest and store the crop have been abandoned and in their places, the half dozen men and few teams now used accomplish as much with better results. The power now as a rule being the farmers horse power or engine or the cheaply hired engine. The improvement in Ensilage Cutters and the general adoption of elevating Carriers, has made silo filling an easy and economical operation, the filling of the silo being included in the operation of cutting. The former excessive treading, and pounding of the silage to exclude the air and make it settle, are operations well nigh abandoned.

IN THE FIELD.

In cutting long silage corn the present styles of reapers seem to be abandoned. Not that it is impossible to cut corn with them, but in corn 12 to 14 feet in height, the reapers leave the corn in such unhandy positions that it is difficult to put it upon the wagons, with the result that there must be a great deal of assorting and straightening of this corn before it can be loaded, which is expensive; and now many prominent siloists, of Northern Ohio, at least, have re-adopted hand cutting. The cutter takes two rows and cuts a small circle and deposits the gavel at his feet, and then steps forward into the standing corn and repeats the operation, leaving the fodder in the perfect gavel. This is now regarded as the best way by many who have large amounts of corn to handle.

HOW TO CART TO THE SILO, is another distinct feature and has called out a great deal of thought and no little invention. The low wheeled wagon with its platform rack (See Fig. 13) and cleated trail plank for the men to walk up and deposit the gavels of fodder, across the wagon is yet the most popular way of transporting fodder corn. The wagon with the fore and after wheels far apart, and its low swung rack (See Fig. 14) has some good features, and is much used. The advantage of the higher platform, however is that the fodder can be half swung off from it upon the table of the cutting machine which is located below the level of the wagon rack, and the corn unloaded without an up lift, thus the whole manual labor in transporting and cutting the corn consists in only once completely lifting the fodder, and a half lift as the partially raised bundle of fodder is thrown upon the table of the Cutting Machine from the wagon.

ROSS ANGLE CARRIER DELIVERING TO THE RIGHT



(SEE PAGE 47.)

ECONOMY IN FILLING THE SILO.

Every movement of the fodder should be toward its location in the silo; every step and action of the men should count, and no second handling should be permitted where one will do as well, or better. There should be no long platforms across which the fodder must be carried to the machine. There should be only one up hill feature in the whole operation and that the placing of the fodder upon the wagon. All the rest should be down hill work for the men, and the cut fodder should be elevated into the silo by means of a Carrier attached to the Cutter and run by power.

TO BEST AND MOST ECONOMICALLY unload the wagons and cut the fodder and elevate it into the silo, three essential features should be observed. First, the space surrounding the feeding table should be kept clear on both sides. Second, to accomplish this the belt which drives the Cutter must be run directly away from the Cutter and not forward along one side of the machine as one side is thus completely shut off.

Third, in order to accomplish the first and second features mentioned, a Carrier delivering at an angle either to the right or left, should be used as the Cutter can thus be located close up to the silo. Otherwise with a straight delivery Carrier, the belt driving the Cutter must run forward and cut off all the space on one side of the feeding table because it cannot be run backward, there being no room for the power between the Cutter and the Silo walls, unless an exceedingly long Carrier be used. By the arrangement shown in the illustration, (See page No. 46), the Cutter, Carrier and Power can be located and run to the greatest advantage and capacity. This arrangement is especially effective in filling silos in the bays of the barn where they cannot be filled from the outside, or in case of rainy weather. By the aid of The E. W. Ross Co.'s new 70 degree Carriers, the Cutters can be located in narrow spaces between buildings, or upon barn floors just inside the doors, being capable of delivering over silo walls 24 feet high or more on a barn floor or space 10 feet wide.

IN BUILDING AND ARRANGING THE SILO the approach of the wagons and the location of the Cutters, Carriers and Powers should be taken carefully into consideration Where, however, this has not been done, or the surroundings prevent the aforementioned arrangement of the machinery, Bevel Jacks or countershafts for driving the

Cutters, &c., may be used to good advantage. When, however, it is possible, the Cutter should be set outside the silo upon the ground, when the teams can come up close along side the feed table of the Cutter, so that the man who drives the wagon can unload the fodder, without any help or assistance and drop it upon the table of the machine. By this arrangement the working force at the silo can be reduced to two men only, viz: the man who feeds the Cutter, and the engineer who can easily tend the engine or power, and keep the silage in a pit 18 feet square, leveled off, and tread all that is necessary to make sweet ensilage. Four men in the field, and three teams, a total force of six men should with a good machine cut and put into the silo 50 tons per day in seasonable weather. By this plan a silo can be filled both quickly and cheaply.

OTHER DEVICES ARE NUMEROUS for drawing fodder from the fields, but they are all modifications of the two methods here described. To get the fodder to the Cutter expediently it requires the corn to be cut as fast as wanted. By one plan the corn is cut by the acre, by men who have nothing to do with the drawing or filling. By the other plan the six men noticed, cut their own corn. The afternoon before silo filling commences all six men cut corn, and after this, they all cut an hour and a half each morning, and an hour after dinner. One man is left in the field as a general helper.

At the very start, all four men load wagon No. 1 which starts for the silo. The three remaining men then load wagon No. 2 and so on. As a rule the wagons will be loaded by three men, wagon No. 1 getting back to the field in time for the driver to help load wagon No. 3.

THE WORD "MICROBE" in this treatise is used in its generic sense as covering all the different species or families of germs. The bacteria family is one of the many species of microbe germs and the one in particular which causes the fermentation in the silage.

TO HAVE SWEET SILAGE is now the aim of the siloist. To do this, the first essential is mature corn of full developement, cut when passing from the glazing, to the denting stage. The corn can then be harvested and drawn in as fast as the owner may elect, or the proximity of likely frosts suggest necessary. The temperature necessary to kill bacteria is about 125° Fahrenheit, but it is no longer considered necessary to wait for each day's filling to reach this temperature, and allow the silage to settle before cutting and adding fresh fodder, as sweet silage is dependent upon certain chemical changes that take place in the silo, and the more per-

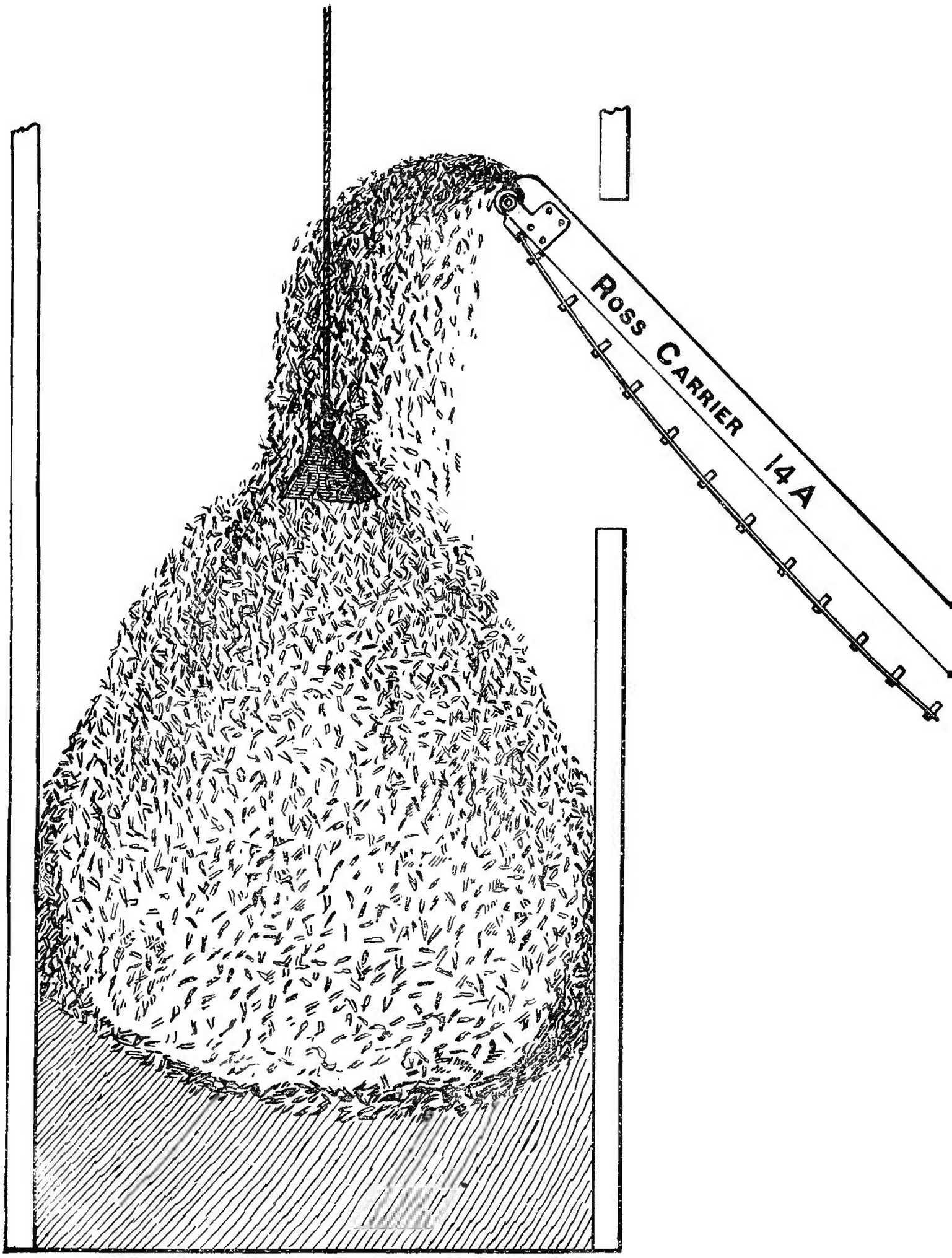


Fig. 15. Cheaply made Distributor. (SEE PAGE 50.)

fect the corn, and the nearer it is to the denting stage, the greater the success. The two pit silo, however, is better than the single pit, for the reason that alternate filling of the pits gives the silage more time to heat and settle, which enables the owner to fill the two pits nearer full than when the filling is continuous in the single silo; besides, the smaller the pit the less the surface left exposed when feeding.

IN FILLING THE SILO the Carrier should discharge the silage as nearly above the center as possible, to save labor in leveling the surface and in filling the sides and corners. If a "distributer" (see Fig. 15) is hung just below the discharging point of the Carrier, the descending stream of cut silage is divided at the greatest height, and thrown nearly all over the silo. If it is well arranged there will be no need of any one in the silo oftener than every second or third load, and then not to level the pit off but to keep the silage much the highest at the walls and corners. This being done, but a very little treading is necessary, only enough to keep it settling at walls and corners as fast as in the center. The distributer is a common made box about 3 feet square at the base and tapering to a point at which rope is attached for hanging to rafters.

A VERY LITTLE THOUGHT will show that excessive tramping along the walls is wrong. The greater part of the reputed loss at the sides and corners is more largely due to excessive tramping, than to other causes unless it be poorly constructed walls. The heating of the silage is occasioned by the air and bacteria within it. The more closely it is packed while filling, the less air will be left in it, and as a consequence, that next the walls will not heat up so readily as in the center, which is always as a rule, good. In the past two years, tramping, excepting to a limited degree, has been avoided in the writer's silos. The silage next to the walls has developed heat up to the proper temperature, the heat has thrown out the air, and the microbes, at the proper time, have been killed by the same heat that expelled the air. There being no fresh addition of air to re-ferment the silage, it has settled down solid, and that against the walls and in the corners has shown no difference either in appearance, color, or taste from that in any other part of the silo, which resulted in the *ideal sweet ensilage* that is the aim of every silo man to produce.

SWEET ENSILAGE.

The scientists have for some years been trying to tell what constitutes sweet ensilage, and to explain the nature of the causes and effects that result in producing sweet silage from fodder corn. Perhaps Prof.

Manly Miles has come as near as any one to giving its true definition, which stripped of all technical terms he illustrates as follows:—taking bread making as a parallel operation. A certain amount of yeast is added to the dough for the purpose of producing fermentation by means of the countless multitudes of microbes or germs of ferment in the dough. When these germs have multiplied to the necessary extent through the agency of moisture, air and warmth, the bread dough is said to be light. The housewife then puts the loaves into the oven and by raising the temperature, kills these yeast germs; the gases are also liberated and sweet wholesome bread results. Had this dough, however, when "light", and full of microbe life, been allowed to remain for some considerable time before baking, the resulting bread would be sour to a greater or less degree and often soggy, this sourness being caused by another distinct class of germs to which the original germs of the yeast gave place, resulting in a different chemical change from that originally intended. Now as regards the corn, in the very beginning, sour, rank smelling silage was the rule. This was in part the result of overseeding, and crowding the corn plant, causing loss of nutritive qualities, and in part, the early cutting, before the sugars and starches were abundant. Consequently there was an excess of sap in the fodder. The bacteria germs, which produce the fermentation in the watery sap of unripe half grown silage, differ essentially from the bacteria which finds existence in the mature corn plant full of starch and sugar. The latter is more in character like the bread yeast microbe. As the silo is filled with the ripe, mature corn, fully charged with starch and an abundance of sugar, this germ becomes active and thrives until by fermentation the heat of the silo reaches 115° to 120°, when it is killed by the heat it has produced. Now if the silo walls are well-made, and no new oxygen can enter to bring new bacteria, and cause fermentation, there can be no further change in the silage. The heat gradually falls to about 75° or 80° and there remains for indefinite periods. THE DEVELOPEMENT OF THE HEAT and the settling of the mass has expelled the air from the silage, and the carbonic acid gas in the silage being heavier than the air, also prevents its return. Thus we have sweet silage, and further, with this sweet silage considerable chemical digestion of the food has taken place similar to the digestion of the stomach, as we are told by such eminent authority as Dr. Wm. Dickson, of Minnesota.

THE SOUR SILAGE continued sour because the microbe germs developed therein are not killed by the fermentation and heat, and one germ

succeeds another until acetic acid is produced in varying quantities; but this being the case, it is not clear why any objection should be raised to feeding cattle the small amount of vinegar such silage contains. The two chief objections would be that such silage had its food value impaired by excessive souring, and its very rank smell. When we speak of sweet ensilage we do not mean that it is absolutely sweet to the taste, or smell, but that in the operation of ensilaging it we have not increased the percentage of acid naturally contained in the crop. Green grass as well as corn fodder contains naturally quite a notable percentage of acid, and in sweet silage we do not increase this acid, or make it more conspicuous by liberating some of it to the air and smell. Silage is sweet by comparison. "That fermented food is objectionable or injurious is not sustained by the facts." Bread is fermented as much as silage. Some of the most nutritious foods are highly so; the gastric juice of the stomach is very acid, and a large per cent. of our foods require vinegar to render them more digestible. Many of the best medical tonics contain acid largely, and without acids there could be no digestion."

LOSS OF SILAGE BY FERMENTATION. This is a matter still in dispute by the best authorities, but all investigations go to show that the loss of any silage crop is not as great in the silo from all sources, as the simple act of field drying the same crop. Late analysis of silage made at Madison, Wis., only showed about 14 per cent. loss in digestible matter by ensilaging the crop, while by the best method of drying, like corn in the shock, there was a loss of about 20 per cent. When the question of digestion arises, the difference is more marked. The analysis of excrement of a silage fed cow indicated that the indigested matter was only one per cent., whereas with the dry corn fodder, it was by analysis, over 10 per cent. Another important feature of investigation shows that the digestion of silage was accomplished with about the same expenditure of stomach force as is required in the digestion of grass. But the stomach power required in the digestion of dry fodder was much greater, as the hard cellular tissue of the dry fodder must be broken down before digestion could begin. With silage, however, the simple act of eating it, put it into the stomach in digestible form. Prof. L. B. Arnold once expressed this condition as follows:

"With dry food, nature is heavily taxed at all points to make good the lack of the natural juices of the plant. The woody fiber of the plant must be broken down and disintegrated by the power of the gastric

juice in the stomach in order to set free the nutriment contained in the plant. The force thus required is several times greater than where succulent food is fed. All extra calls upon the animal economy must be made good by extra food."

WHERE CORN IS SHOCKED IN THE FIELD there is a continual, never ceasing loss going on; a breaking down and disintegration of the stalk by the action of water, and atmosphere, and the destruction by vermin, to such an extent that the real feeding value of field fodder does not extend much beyond April 1st. It was ascertained the past winter that fodder well-shocked in the field, had by Feb. 1st., parted with over 50 per cent. of its original feeding value, whereas, the corn in the silo after the fermentation had subsided, had not lost any appreciable per cent. of its value.

IN THE PAST, ALL KNOWN DEVICES for an economical curing of fodder have seemed to fail, so that it became general to leave the fodder in the field until wanted. In certain seasons, corn fodder can be stacked, or ricked with partial success. To put it into the big bay of a barn is to invite fermentation, because there is no way of preventing the ingress of fresh air at the sides to take the place of that carried up, and out by the developing heat. This fresh air brings with it, fresh germs to increase the fermentation, and thus mould ensues. Oftentimes the action upon the fodder produces a condition similar in effect to spontaneous combustion, resulting in a total loss of the food elements of the fodder, and with them goes the result of all labor, and anticipated profit. These wastes are avoided in the silo on the one hand, and on the other, the economy in feeding is great, as the whole stalk is consumed with relish and profit, much nutritious food being contained in the ensilaged stalk "that in the butts being equal to the best oat straw." The silo thus secures a concentration of both labor and food, bringing them together at the end of the feeding alley, and all under cover, thus making the farmer who has a silo, independent of the storms of winter, its mud, rain, snow and drifts, thereby avoiding a vast expenditure of labor at a season and under circumstances where but little can be accomplished and which can be rewarded by no profitable compensation.

DRY FODDER FOR SILAGE. Within the past two years several experiments have been made in filling silos with dry corn fodder. Some of this fodder was that which remained after husking; some was corn planted for silage, shocked and left in the field for want of room, and some was dry fodder ensilaged in silos

built after the regular silage season. One of the first men who ventured this experiment to any considerable extent was Mr. O. Griswold, of Macedonia, Ohio. He filled a large silo with corn and fodder, some six weeks after the corn had been shocked in the field. In order to compensate for the natural juices of the plant, a hose and sprinkler was attached to the big water tank, and as each load of this very dry fodder was cut into the silo it was liberally sprinkled. This caused the fodder to settle compactly and to heat up to a fair temperature, and was thus made into good No. 2 silage. Mr. Griswold fed this silage and compared results with some of the same fodder left in the fields and fed at the same time, and is satisfied that it was a good investment of material and labor, as farther deterioration of the fodder in the silo was inconsiderable as compared with the field fodder. Last season Mr. Edgar Huidekoper, of Meadville Pa., filled a large silo very late in the fall with field corn that had been in the shocks for some six weeks. Each load when cut, was moderately sprinkled with water. The result was gratifying. There was some loss in the corners and a little at the walls, a result due no doubt to an insufficient amount of water being sprinkled at these points. Mr. Huidekoper now inclines to the opinion that the best silage will be made with corn about right to husk, and sprinkled down as the silos are filled. Other testimony comes in along this line. Mr. Talcott, of Jefferson, Ohio, leaves his field corn in the field, shocked, until one silo is empty, and then fills it from this field corn, commencing immediately to feed it, and while it heats up fairly, the feeding is more rapid than a chemical change can take place at the surface, and he escapes with little loss save that of the original drying. While those who have tried this dry fodder silage are satisfied with it, none claim it as superior to putting up the green fodder. It is far more difficult to cut. The silo cannot restore to the dry fodder what it has lost, nor its original digestibility, but it does make it more palatable and easier fed, creating a large saving by having the coarser parts consumed. Instead of cutting fodder each day for the stock, the fodder is cut at one job, and economizes time. The chief point is, that it is possible by this process to save a big surplus corn crop which otherwise would rapidly deteriorate.

The final act is to cover the silage. To do this well and economically, many methods have been tested since the early adoption of ensilaging green crops in this country. Among these methods some have been attended with most favorable results. The old idea was that the

silo must be immediately covered after filling, and not only must there be tight planking, but on these planks must be placed heavy weights of various kinds, such as stone, boxes of sand, barrels of water, loads of dirt and loads of cord wood, &c., whichever was the most convenient and cheap. The handling of these weights on and off added no little sum to the labor bill, and to avoid this, various methods have been resorted to, each simplifying the previous process, and establishing new facts that have caused the "old" practice of heavily weighting to be nearly discarded. The experience of practical farmers has demonstrated the past few years that a close cover on a pit of silage, is not altogether necessary as a means to better preserve the silage. Results in many instances go to show that it would be difficult to devise a cheaper, or better cover than a foot or two of wild grass, green hay, or even a thick layer of old straw well trodden down upon which a few old boards or plank have been thrown to assist the straw in packing under the influence of heat and ascending moisture.

THE FACTS ABOUT COVERING ARE: The silage in its slight ferment evolves sufficient heat to cause the imprisoned air to rise, and the "yeast" plant to develope a quantity of carbonic acid gas, which being heavier than air, takes it place. If the silo is left for a few days before covering, the air has about all been expelled by the settling and compacting of the silage, and as weights cannot expel what does not exist there in any considerable quantities, the use of a weight is not apparent. All that is now needed is something to simply protect the surface, and the straw, or green hay does this admirably, and the loss by this plan, as a rule, is no greater than when planks and weights are used, if as great, because the silage in settling does not do so evenly over its whole surface, and as a consequence there are depressions formed underneath the planking into which the air can enter. Some go beyond this, however, and use no cover of any kind, allowing the silage to "crust" over, which it does in a few days, and this mass of white mould, not often more than three inches in thickness, forms a perfect protection against the air. In the hay or straw covering, the mould frequently takes place in the covering which absorbs any little evaporation that takes place, while the silage wholly escapes. Silos that were seen by the writer in August, which had remained uncovered from the previous May, had not moulded upon the surface to exceed three inches, and under that layer the silage was very bright and sweet up to the mouldy cover. Taking one silo with another, the loss of silage will rarely exceed one

ton upon the surface, and with the straw cover well tramped down, the loss is usually only a few bushels. It is now thought that if after filling the silos, a load or more of silage is left in the center in the form of a cone in order to heat up well, and it is then pitched to the sides and corners and tramped, little loss would result, and as it could be packed down quite close, it would not need to heat; and if the straw was well tramped over it, no considerable loss could ensue.

TO REMOVE THE SILAGE. It is generally conceded that it is better, more economical in labor, and more expeditious in feeding, to take the silage off evenly from over the whole surface of the silo than to remove it by any other means. Throw off the covering to the silage and open the door at the top by removing the top section, (See Fig. 7) to bring the opening on a level with the top of the silage. The top of the silage can then be raked or scraped off through the door opening down a rough board chute, and discharged directly into the feeding cart on a level with the feeding floor below. Or if necessary to elevate the silage, the same Carrier which was used to fill the silo can be disconnected from the Cutter and placed in the silo, its hopper filled and elevated by a hand crank with the greatest ease. If an inch or more of silage is removed every day or every two days, no perceptible change will take place in the silage. When the silage is only partially uncovered and is cut down, hay mow fashion, there is an unnecessary amount of manual labor performed, and there is more or less injury occasioned by fresh air entering into the exposed perpendicular surface of the silage often producing considerable loss therein. There are many practical siloists, however, who contend that it is best to cut down on the perpendicular as described, but the larger number remove the silage from the top and hold their methods to be the best and most economical in many ways. Where section doors are used, like the one illustrated in Fig. 7, the feeding truck can be backed up under the door to receive the falling silage which is then simply scooped out of the cart, directly into the manger.

AN EARLY PATENTED DEVICE RE-CALLED.

Shortly after the introduction and adoption of the system for ensiloing green fodder crops in this country, a device was brought out in the Eastern States with more or less success, with the aim of preserving the silage without fermentation by means of a series of perforated iron tubes distributed throughout the silo before it was filled,

and connected so that not only the interior air was facilitated in its escape, but also a certain amount of the juice of the green fodder escaped through these same tubes, and settled near the bottom of the silo. The silo was also double plank covered, and by means of cross beams, jack-screws were used to settle the ensilage. As the pressure was applied, the air escaped from the silage through these pipes. Pressure enough is applied to cause the juice to fill the pipes to a depth of two feet from the bottom. As soon as carbonic acid is formed, this also escapes through the pipes; then both air and gas being withdrawn by means of this device, the juice is again drawn up through the silage by the force of capillary attraction. The surplus juice which is "clear, sweet and odorless" is a valuable liquid to "mix with shorts for cows in milk." In filling such a silo, it is essential that the fodder be not cut coarse, in no case over ½ inch long. The party who got up the device did not think a silo would be sufficiently strong unless built of plank 12 inches wide, spiked flatways upon each other, the full length of the silo, so as to make a solid wall of wood 12 inches thick, which should be cemented on both sides up to the top of the silo. Owing to the necessity by this operation of expressing from the silage a quantity of juice which it is desirable to retain, the walls of the silo to the length of three feet at the bottom should be built of stone and the best of cement. For a silo 20 feet deep and 16 feet square, two devices would be needed, costing $30 each. It is claimed by the Patentee that while the cost of such a silo, piping, jack-screws, &c., &c., for a 150 ton silo would be in the neighborhood of $500, yet it would ultimately be cheap as the silage does not ferment, does not develop foul odors, or show any sign of heating. The claims for this system by its author exceed anything yet advanced in the line of silos, yet they are all more or less in direct opposition to the teaching of Dr. Manly Miles, Prof. Robertson, of Canada, and many others of the recognized teachers regarding silage.

THE CONCLUSIONS ARRIVED AT are drawn from a great mass of testimony from thousands of sources, some of which are given in the succeeding pages as proof positive. Some of these may partake somewhat of the zeal of the "newly converted," but the greater part of them are the conclusions of sober second thought. This Resume is presented to our friends as embodying the very latest and most reliable information regarding silage in every aspect. It morever is collected from the practical experience of hundreds of successful silo men; and this experience and information is herewith condensed into readable form, in which labor

the writer has been guided by his own experience as a siloist of many years.

Respectfully,

JOHN GOULD.

SILVER CREEK, N. Y., April 7, 1890.

THE E. W Ross Co., Springfield, Ohio.

Gentlemen:—I purchased of your agent at Rochester, N. Y., early last fall, a No. 14 A. Cutter, Carrier, Horse Power, &c., for cutting ensilage, dry fodder, &c. Can say that the machine does everything it is recommended to do in the way of good work, and I am more than satisfied with it. The only trouble I find is my inability to get corn to the machine fast enough.

Yours truly,

ISAAC GOULD.

J. K. BROWN,

Of Albany, New York.

DAIRY COMMISSIONER, STATE OF NEW YORK.

SILAGE FROM MANY SILOS.

CONFIRMING EACH OTHER.

CHEAP FOOD.

Corn ensilage for milch cows is no longer an experiment. I would advise any dairyman who is still in doubt, to plant one or two acres of corn of the largest variety that will mature; sweet, flint or dent, and when it is at its best, or ready to harvest for the grain to cut and put it into a silo whole. He can make a silo by cutting out a place in his hay-mow large enough to hold the corn, lining the inside with boards to prevent the corn from adhering to the hay in settling. Cover the corn with straw and weight it enough to exclude the air. If the corn is well packed and right when harvested, he will have good ensilage. I have used ensilage for eight winters; two years without cutting, and six years cut one-half inch long.

W. H. GILBERT, in F. & H.

NEW YORK EXPERIMENT STATION.

We fed ensilage last winter with excellent satisfaction to our patrons; but as the milk is all delivered fresh, we have no data as to its keeping qualities. Second, the small amount of butter that we have made, has been of excellent quality. Third, when we feed a properly balance ration, we see very little difference in quality of butter, whether ensilage or dry fodder is fed.

IS DIGESTION COMPLETE?

"Is the digestion of silage complete, so that whole grain will not pass the cattle, like dry corn"?

The digestion of silage is more perfect than in feeding the fodder in September, cut and fed the same day. The ripening of silage is now re-

garded by our best investigators, like Miles, Henry, Whitchter, and others, to be a digestive process, and not strictly a ferment; also that the food is to a slight extent fitted for a more perfect work of digestion. I have never as yet discovered a kernel of grain in the gutters, and the corn fodder was heavily eared, and not cut until dented. Dry corn or meal is never fully digested.

JNO. GOULD.

RANDOLPH, VT., March 18, 1890.

THE E. W. Ross Co.

Dear Sirs:—I purchased one of your No. 14 A. Little Giant Cutters last fall and can say that I am perfectly satisfied with the working of the same. I filled a silo containing 86 loads, in just two days. I used a two-horse tread power and a pair of 1,800 pound horses.

Respectfully,

L. J. HARRINGTON.

HORSES FED ON SILAGE AT THE OHIO EXPERIMENT STATION.

We fed our horses ensilage last winter from about the first of February until the first of May. You know farmers' horses usually do not have much to do during the winter season, but we had, out of sixteen, four horses working almost every day. We did not feed them wholly on ensilage as rough feed. We gave them about the same grain ration that we did when feeding hay. We are feeding all our horses at the present time about twenty pounds of ensilage, giving them ten pounds in the morning, and ten at noon; in the evening give them probably ten to fifteen pounds of hay. We are working the same this winter as we did last, having four of the horses at hard work every day, and I think it is a very satisfactory feed. But it is the same with horses as it is with any other stock, it is not best to make it the exclusive feed. We are all ready to admit that there is no single feed that we can feed, either to cattle or horses, or even to man that makes a complete ration.

J. F. HECKMAN.

INDIANA HOGS LIKE SILAGE.

We have fed our sows for four winters, about twenty-five in number, equal parts of ensilage and corn meal put into a cooker and brought up to a steaming state. It has proved to be very beneficial to

them. It keeps up the flow of milk of the sows that are nursing the young, equal to when they are running on clover. We find, too, when the pigs are farrowed they become more robust, and take to nursing much sooner and better than they did in winters when they were fed on an exclusively dry diet. We also feed it to our sheep. To sixty head we put out about six bushels of ensilage. We also feed it to our poultry.

J. W. PIERCE.

WHO ARE THE OPPONENTS?

The opponents of the silo take it for granted that we will always have fair weather in which to cure dry fodder, whereas every year thousands of tons of dry fodder are damaged by unseasonable weather. Further, cattle fed on silage require less grain than those fed on dry fodder. This has been proven. The silo offers the most to the dairyman. To the dairyman with a silo there is no off season, no time of small milk product or of inferior butter. And dairymen should consider another thing that has been proved, that cream from ensilage fed cows yields up the fat in the churn about 12 per cent. more exhaustively than cream made by feeding dry forage.

HIRAM SMITH.

ENSILAGE FOR FOWLS.

[From Orange Judd Farmer, June, 1890.]

Clover and corn ensilage is one of the best winter foods for poultry raisers. Let me tell you how to build *four Silos for One Dollar.* Buy four coal oil barrels at the drug store, burn them out on the inside and take the heads out. Go to the clover field when the small June clover is in the bloom of the *second* crop, and cut one-half ton three-eighths of an inch in length; also one-half ton of sweet corn, and run this through the feed cutter. Put into the barrel a layer of clover, then a layer of corn. Having done this, take a common building jack-screw and press the silage down as firmly as possible. Then put on this a *very* light sprinkling of pulverized charcoal, and keep on putting in clover and corn until you get the barrel as full as will admit of the cover being put back. After your four barrel silos are filled, roll them out beside the barn and cover them with horse manure, allowing them to remain there thirty days. Then put them away, covering with cut straw or hay.

When the cold, chilling winds of December come, open one of these "poultrymen's silos," take about twenty pounds for 100 hens, add equal parts of potatoes and ground oats and winter rye, and place same in a kettle and bring to a boiling state. Feed warm in the morning, and the first thing you know you will hear, along about 9 a. m., this grand chorus from your layers:

Sweet prospects, sweet birds, and sweet flowers,
Have all lost their sweetness to us;
The mid-summer sun shines but dim,
The fields strive in vain to look gay;
But when "Ensilage" we eat,
December's as pleasant as May.

Not only will your layers give you a grand morning song, but you will be enabled to market seven or eight dozen eggs per day from 100 hens through the winter, when eggs bring good returns.

CORN BETTER THAN SORGHUM.

Prof. Georgeson, of Kansas, says that corn proves better as an ensilage crop than sorghum, and one acre of corn as ensilage, fed in connection with some grain, fed fifty head of cattle for 23 days. The daily ration of ensilage was thirty-five pounds to each animal. He further says that large Southern corn gave the best results, and that thick planting much closer than for ordinary field corn was most profitable.

FOR HORSES AND SHEEP.

I have fed ensilage liberally to sheep for three winters and am remarkably pleased with the results. I make ensilage half the daily ration, the other half being corn stalks, or timothy hay with bran or oats. The sheep do exceedingly well. Formerly I was much troubled to raise lambs from grade Merino ewes. Of late, this trouble has almost ceased. Last spring I hardly lost a lamb. While ensilage may not be the entire cause for this change, I believe it is the main cause. It is positively proved that ensilage is a most valuable food material, when properly fed, for all our domestic animals. We have kept OUR HORSES this winter almost wholly on our ensilage, only adding a little bran, or oats, and they have wintered splendidly. Our ensilage, however, was most excellent. It was really entirely sweet. I fully believe that the silo properly used, is the great benefactor of the farmer.

A. J. COOK,
Michigan Agricultural College.

JOHN SPRAGUE, OF CANADA.

My observations lead me to believe that the older Counties of Canada are on the eve of a mighty change. That change will be in the ownership of our farms, or in a rapid change in the method of our farming. The West, with its new, virgin soil, and easy tillage, has now driven us far from growing grain at a profit. To the business man the day of wooden ships, and stage-coaches has passed; we, too, as practical farmers, should be quick to abandon that which has not been a paying system in the past, and be ready to adopt something better. That something better is, in my opinion, corn and the silo, aided by permanent pasture. By the use of this system of feeding and storing ensilage, the capacity of our farms can be largely increased. We can make our best butter and beef in the winter when both are in best demand, and bring the highest prices. We had 130 tons of green feed from 13 acres and valued the ensilage at $7 a ton as a feed.

CONFIRMING A COMMON REPORT

We have tried treading and packing the silage as the filling progressed afterward weighting the mass heavily with rocks, and we have filled the same silo without treading, or subsequent pressure of any kind. In the latter case, the silage kept as well and came from the silo, it seemed to me, in much better order than that which had been thoroughly tramped and weighted. In filling, the stream of silage should fall at as nearly as possible the center of the silo, and it is wise to level the mass frequently, treading down the sides and corners, that settling may go on evenly. After the silo is full it may be covered with almost any material that will tend to exclude the air.

PROF. SHELTON,
Kansas Station.

GAITHERSBURG, MD., March 10, 1890.

THE E. W. ROSS CO.

Gentlemen:—I have used your 14 A. Cutter and 34 feet of Carrier four years, running same with ten horse-power engine, putting away from 150 to 200 tons per year. I find it satisfactory in every way, especially in capacity and durability. It is one of the best investments I have on the place.

D. M. MUNRO.

HOW AN OHIO FARMER FIGURES IT

How these fellows who do not know anything about silage, except what they hear fourth handed and get the sound of through that their shoulder blades instead of their ears, get caught up when they get hold of a man like C. R. Beach, Col. F. D. Curtis, and others who do know something about it. I can, and I do, make a milk so fine on ensilage ration that my creamery man cannot pick it out from the best clover hay and meal milk, but the corn was matured, well-eared, and the grain glazed when it went into the silo. I know where the profits come in, when on one side of the alley I fed $9 hay to one lot of cows, and silage on the other side that cost me about one cent per bushel, the grain fed being the same to both lots of cows. Figuring it one way the hay is worth 45 cents per hundred, or 15 cents per day to a cow. To this add 6 cents worth of bran and oil meal, makes the ration cost me 21 cents to get 31 cents worth of milk, while the silage ration has only cost me about 2 cents. Figuring it another way, allowing 2½ tons of silage against a ton of $9 hay, and fifty-five pounds for a day's ration, at 18 cents per hundred pounds, the cost is not quite 10 cents per ration, or a profit, as between silage and hay, in favor of the former of about 11 cents a ration.

These figures will vary according to different conditions, but I know that I pay out $2 in money to get a ton of hay into the barn, and about 25 cents to secure a ton of ensilage.

TALK AT AN INSTITUTE.

Mr. Powell in his address strongly advocated the silo, and regarded the ensilage as the very best and most nutritious food for stock. He said the first silo in this country was built by Francis Morris, of Maryland, in 1876. In 1880 there were only six silos in the United States. During the past year 6,000 have been constructed. He expressed the opinion that the silo was the most wonderful invention of modern times, and showed the mode of constructing it. Some farmers thought it too costly. It need not be costly, as a portion of the barn basement could be converted into a silo at a very small outlay. Make the compartment water-proof at the bottom by having the floor cemented, and make the sides air tight and air-proof by a paper lining, A silo could be erected at a convenient place on the farm if the barn was not utilized. Use

studding 2x8 or 2x10 on a balloon frame or make a frame 16 feet square. Board it up with cheap material, but make it air tight, frost proof and water-proof. The speaker recommended corn that would give the greatest yield. The corn must be of the best quality to be profitable. Cover it over with hay or straw, and pack it down well at the sides. The ensilage will be found the most succulent, nutritious and digestible food that can be obtained. The speaker had demonstrated it on his own farm. He showed how a cow on his own farm was fed at an expense of 17 cents a day that gave 42 pounds of milk, making a cost of producing the milk, ¾ of a cent per quart. Butter from ensilage fed to cows was one of the finest quality and flavor. The speaker said that cows in winter must be kept in warm and comfortable stables and should never be exposed to the cold. In answer to a question he said the cost of ensilage, filling and all was about $1.90 per ton.

WHAT DID IT COST TO DIG THE PIT?

I have read with much interest Mr. Gould's article on "Ensilage in Northern Ohio", and as he invites discussion I will, with your permission. give our experience upon some of the points he mentions. We were in the same fix last year as Mr. Gould in having 100 loads of corn more than our silo would hold, but adopted an entirely different plan to secure the corn. We dug a pit opposite our Cutter, 4 feet deep, 16 feet wide and about 20 feet in length, at a cost of $14.00. We cut and delivered into the pit. We opened the pit Nov. 1st., and found the ensilage in prime order just as good as that stored in our silos. It lasted our stock of 125 animals, 40 days before we opened silo, and gave us a chance this spring to sell hay to our neighbors to the amount of $200. This year the same condition occured, and we have used the pit again and expect to find it all right when we open it. It certainly did not cost us one-half to cut it and put it in the pit that it would to have stooked it and dried it (an impossibility this fall) and hauled it to our barns.

COR. COUNTRY GENTLEMAN.

COL. WM. LIGGETT,

Secretary Minnesota State Board of Agriculture, and Noted Cattle Feeder and Extensive Farmer.

WHAT THE SCIENTIFIC MEN SAID IN 1889.

NEWS AND EXPERIMENTS—ALL GIVE APPROVAL.

THE MICHIGAN AGRICULTURAL COLLEGE HAS AN EXPERIMENT.

In comparing dry fodder corn with ensilage, the writer found in one test that an acre cut and put in the silo weighed 35,360 pounds. An acre of the same corn fairly dried by the usual method weighed 10,880 pounds. In other words 3¼ pounds of ensilage made 1 pound of dried fodder. In the same trial 51,343 pounds of corn were put into the silo September 12-15 We commenced feeding Dec. 15th, and each load was carefully weighed. The feeding was finished April 1st, (exposed a long time), and but a few cubic feet of the ensilage remained in the silo. The number of pounds weighed out was 44,315. This indicates a loss of 7,118 pounds, or about 14 per cent. I estimated the loss in weight of the fodder corn by drying out in the barn about the same as ordinary hay, from 15 to 25 per cent. Of course this will depend on its dryness when put in the barn. I incline to the opinion that in ordinary seasons, with our usual amount of wet weather, this estimate of the shrinkage of the dry fodder is not excessive. In this case the fodder corn contained 22,85 per cent of water, while the ensilage contained 79.60 per cent. The saving with the ensilage is not to be measured by the comparison of the dry matter in it, with that in dried fodder alone. It is in the fact that it is saved so that it may be all utilized in the feeding. The more mature the corn, the more dry matter.

SAMUEL JOHNSON.

PROF. HENRY OF WISCONSIN.

Prof. Henry said at the Madison, Wis., Institute, that at the station they had steers gain 1½ pounds a day for thirty-six consecutive days, fed exclusively on corn silage, in which there was practically no corn. On corn silage made of well-matured corn, well-supplied with ears, another lot gained 3 7-10 pounds a day for thirty-six days. All talk upon the silo only tends to build it more firmly in the minds of the people, and to prove that it is here to stay.

NEW CASTLE, PA., Feb. 27th, 1890.

THE E. W ROSS CO.

Dear Sirs:—In reply to your letter will say that I have been using one of your No. 13 A Ross Cutters for several years. It has given perfect satisfaction. The work it will do, and its durability I think are unsurpassed by any other, and I heartily recommend your Cutter to any one wishing to invest in a Cutter. I will have to have a Carrier to my Cutter this coming fall. Yours truly,

M. HARTZEL.

WHAT DR. GOESSEMAN THINKS.

Prof. Goesseman, of the Massachusetts Experiment Station, who has given this subject much attention from a chemical standpoint, says in the report for 1887: "It was found that the same variety of corn, raised under fairly corresponding circumstances, as far as the general character of the soil and the mode of cultivation are concerned, contained, in one hundred weight parts, at the time of the first appearance of the tassel, from twelve to fifteen weight parts of dry, vegetable matter, and from eighty-five to eighty-eight parts of water, while at time of the beginning of the glazing of the kernels the former was noticed to vary from twenty-three to twenty-eight weight parts, and the water from seventy-seven to seventy-two.

Speaking of changes in plants composition, he says: "As long as the vital energy of an annual plant is still essentially spent in the increase of its size, as a rule, but a comparatively small amount of valuable organic compounds, as starch, sugar, &c., accumlate within its cellular tissue. The comparative feeding value of the same kind of fodder plants or any particular part of such plants, is not to be measured by its size but by

the quantity of valuable organic nitrogenous constitutents stored up in its cellular system"

He draws these conclusions: "The amount of vegetable matter in a given weight of green fodder corn, cut at the beginning of the glazing of the kernels, is known to be not only nearly twice as large, as compared with that contained in an equal weight of green fodder corn when just showing the tassels; but it is also known to be, pound for pound, more nutritious; for it contains more starch, more sugar, more of valuable nitrogenous matter, etc."

TRAMPING DOES NOT KILL ENSILAGE BACTERIA.

There are, Dr. Miles tells us, two distinct principal groups of these organisms; one increases by a process similar to budding, to which group, yeast and alcoholic ferments belong; the other increases by fusion, or diffusion, and includes the bacteria. This causes lactic, butyric and similar kinds of fermentation as well as putrefaction. It is these bacteria with which we have to do in studying the fermentation of ensilage; so long as they live they injure the product. In studying the best means to kill these, Dr. Miles found that the silo he was filling, and which had been tramped hard in filling after the then approved fashion, varied considerably in temperature soon after filling, but did not rise above 87° He found that on the next day after the silo was filled, it abounded with bacteria, which exhibited a great activity and were increasing rapidly. He found that when he removed this ensilage and heated it he could kill the bacteria, and that the heat required was under different conditions from 115° to 122°; but that in order to kill the germ seed, or spores from which fresh crops of bacteria were formed, required the moderate heat to be kept up for several days, or a high heat for a shorter time.

NEWBOYNE, CANADA, March 17th, 1890.

THE E. W. ROSS CO.

Gentlemen:—I fully tested the Little Giant Cutter No. 11 A to-day. I cut with it at the rate of a ton and a half an hour ($\frac{1}{2}$ inch cut) with two-horse sweep power. It is far ahead of your recommendation. It is the best machine made. Your truly,

JOSIAH HANNA.

NEXT TO NOTHING.

Our experience has been that the waste of the silo is next to nothing compared with the loss sustained by the commoner method of handling forage. For example, we have found, as a result of careful and oft repeated tests, that cattle will waste (refuse to eat) all the way from twenty to sixty per cent of common corn fodder when cut in one-half inch lengths and fed in the manger. Good ensilage on the contrary, wastes next to nothing. The quite uniform report of those having in charge the college herd has been that the uneaten portions of ensilage, coarse butts, etc left daily by a herd of fifty cattle, when on full allowance, could be carried in a half-bushel measure. This practical utilization of all of the feed recovered from the silo is an argument for the system of ensilage not likely to be over estimated. The stock objection to the use of the silo is the great cost of filling. That the expensiveness of this operation is greatly over estimated by inexperienced persons, we have no doubt. The fact is, filling a silo is nothing like as serious an operation as threshing, or even husking, on an ordinary farm. In filling the silo we are simply compelled to do a large amount of work within quite a limited time. Considering that in filling the silo we, in effect, cut up the corn, shock it, husk the ears, stack the fodder, cut it into suitable lengths for feeding, and grind the grain "cob and all", the silo route is the cheapest one that corn can take between the field and the animals' mouths. We, during the past season, filled an 80-ton silo at an actual cost of a fraction less than sixty-three cents per ton.

PROF. E. M. SHELTON,
Kansas.

WHAT HE ASCERTAINED.

During the season of 1889, the chemist of the New York Experiment Station made a series of experiments to determine what is the best stage for cutting corn for the silo. The results of his experiments lead him to the following conclusions: 1. That the greatest weight of of green fodder is between the period of full silking and milky stage of kernel. 2. That the total weight diminished after this period, but the total dry matter increased. 3. That as the corn approaches maturity, the per cent. of amide nitrogen diminishes, while the albuminoid nitrogen increases, thus seemingly increasing the feeding value of the crop. 4. That the sugars and starch increase rapidly during the latter period

of growth and maturity of the corn plant, and that these are the most valuable portions of the nitrogen-free extract. 5. That between the period of glazing and full ripening of corn, there was a large increase in amount of sugar and starch. 6. That for the greatest amount of nutriment, considered from a chemical stand-point, corn should not be cut before it has well-ripened.

PROF. WOLL'S IDEA ABOUT SWEET SILAGE.

Comparing the ensilage of this season with that produced during the past five years at the station, we can safely say that this ensilage was by far the best yet made at this station. This change from sour to sweet ensilage, without material difference in the method of handling the cane is a difficult thing to explain. The factor of temperature which was first thought to explain the difference between sweet and sour ensilage, does not appear to be sufficient to explain their radical differences. Ensilage of a high degree of acidity, and of offensive odor, has been made when the temperature of the silo has been as high as 150 degrees Fah. while ensilage of a high grade with but a slight acidity, has been made when the temperature has not risen above 80 degrees Fah. A peculiarity of the ensilage formed at low temperature has been that, apparently little fermentation has taken place, the ensilage giving the same green, fresh appearance as when put into the silo. It is evident that sour ensilage can form when the temperature has been as high as 150 degrees Fah., and sweet ensilage when the temperature has not risen above 100 degrees Fah., consequently we must seek for some other factor than temperature to explain the difference. The action of ferments on organic matter is little understood, consequently any fine spun theory concerning the action of this, or that ferment, or what would take place at this or that temperature would be of little value. There is one fact, however, which may throw some light on the cause of sweet and sour ensilage. It is well-known that the amount of water present in a body has a great influence on the kind of fermentation which it will undergo if left to the air. The change from sour to sweet ensilage, has accompanied a greater maturity of the corn; each year the corn has been planted a little *thinner* and allowed to become more mature before being put into the silo, and each year has seen a less degree of acidity in the ensilage. Examination of the analysis of ensilage received from various silos in the State, as well as our own, would seem to indicate

that the acidity varies with the amount of water present in the corn; the more water the greater the per cent. of acid.

PROF. WOLL,
Madison, Wisconsin.

AGAINST STONE SILOS.

Prof. Henry, of the Wisconsin Experiment Station, says: "Probably very few stone silos will be built in the future, as experience shows that a stone-wall, chills the ensilage during the curing process and, if it does not seriously injure that portion next to it a thickness of several inches, it renders it at least less palatable than ensilage nearer the middle of the silo. The reason, in my judgment, that the silo has not more friends in the Eastern States, is owing to the common use of stone in its construction. On our experimental farm at Madison our first silo, built in 1881, was of stone, and our conclusions in regard to ensilage were made up from results obtained from this silo; had we put up a wooden structure, I am confident our results would have been worth vastly more to our people than they have been."

CLOVER ENSILAGE.

Prof. F. G. Short, of the Wisconsin Agricultural Experiment Station, says that too much cannot be said in favor of clover for the silo. There has been considerable hesitation about preserving clover in this way; chiefly, perhaps on account of the extremely offensive ensilage which resulted from some of the first experiments in siloing clover, as in the case of the first corn ensilage the clover was put into the silo in a watery and immature condition. The result was a watery ensilage of a very offensive odor. By allowing the clover to become more mature, and cutting it when the dew is off, it is found that a bright, sweet, palatable ensilage can be made. One of the silos at the station was filled in the summer of 1888 The clover was first growth, and owing to the drought had become rather woody. The only precautions taken were to see that the dew was dried off before cutting, and that in filling the clover was evenly distributed, and well-tramped down in the corners and along the sides. The silo was filled rapidly and immediately covered. On opening the silo the contents were found to be well-preserved, with a slight aromatic odor, and a trace of acidity. It was eagerly eaten by the

cattle, and formed a valuable addition to their rations. Profitable farming cannot be carried on without the help of this wonderful plant; we all know how difficult it is to cure into hay and get it just right, but by putting it into the silo the risk and expense of handling the crop is greatly reduced. Sunny days are not essential when putting clover into the silo. The mower can be started as soon as the dew has dried off in the morning and by noon enough will be cut to keep two men with a team and wagon busy all the afternoon hauling the fresh cut clover and placing it in the silo. It is not necessary in putting clover into the silo to run it through a cutting machine, so that the expense of filling a silo with this crop is very light. To those who appreciate the advantage of having a succulent food in the winter and are willing to incur the expense of building a silo, but are restrained by the cost of the machinery necessary for reducing and elevating corn, we would say, build a silo and fill it with clover.

THE DOMINION MINISTER OF AGRICULTURE.

No single subject connected with agriculture is to-day creating so much discussion or receiving so much thoughtful attention from the farmers of Ontario as that of ensilage. And it deserves more attention than has yet been given to it. A prejudice still exists in the minds of a few farmers against the construction and use of silos. That feeling, which can hardly be dignified by being called a judgment, had its origin in the partial failures of some of the first efforts to introduce that system of preserving fodders into this country. But as the causes of such failures, or the only partial successes in the application of the true theory of curing fodders in a silo, have been discovered, and can always be guarded against, remedied or removed, satisfactory results may now be relied upon with certainty. In the handling of any perishable article, hap-hazard treatment will give hap-hazard results. Occasionally no loss may be sustained, but generally the damage and loss will be proportionate to the absence of applied knowledge and skill. A clear knowledge of "how to do it" with ability, to do just that way, will enable farmers as well as other men to successfully cope with the things most difficult to do well. The simplest and easiest jobs need similar mental equipment in the man who undertakes them. The curing of a crop of fodder corn in a silo is now an easy and certainly satisfactory

task to the farmer who will follow directions with reasonable prudence.

Then came the period when scientific men and others loudly and vehemently advertised the presumption of those who said they found the feeding value of the fodder increased by the heating in the silo. However, the cows were and are of that opinion still, and in estimating the feeding value of a fodder, the verdict of the animal that consumes it is always worth more than the opinion of the chemist. "Oh but", rejoined the chemist, "you cannot take anything out of a silo you did not put into it". But the fact contradicts their assertion. Would a dairyman pay any heed to a "book-scientist" (?) who told him with scholarly dignity and unbecoming contempt for facts, that he could not take anything out of his cheese curing room that he did not put into it? He knows he puts in green uncured cheese, almost wholly indigestible, and that he takes out cured cheese almost wholly digestible. In the same way, to some extent, cured silage has a higher feeding value than the fodder direct from the field. It is possible to cure silage to advantage and in such a way that it may be preserved indefinitely, mainly because the cells of plants continue to live after the stalks are severed from the roots. It is the function of plants while growing, to deoxidize carbon and accumulate the energy of the sun for the future service of lower animals and man. It is the function of animals to oxidize and so expend the energy previously stored in the plants and which they have appropriated in the form of food. The cells of plants in the stalks, leaves and grain, after these parts are separated from the root or whole plant which bore them, simulate the action of living animals so far that they begin to absorb oxygen, and evolve carbonic acid. In this manner is heat generated. And if these cells be robust from sufficient maturity, the temperature will be considerably increased. Robust cells from plants almost mature are also much less liable to become the prey of minute bacteria. They are able to resist their attacks. If confined in bulk in the presence of ordinary atmospheric air, they will raise the temperature to a point between 125° and 150° Fah. When the temperature is maintained anywhere between these points for some days the life of the cells is destroyed, as are also the spores of mould, &c., which will have been deposited from the air on the plants or parts of the plants. These spores are practically everywhere disseminated. Hence in filling a silo the observation of a few simple requirements are indispensable to success.

1st It is essential that the silo be air tight and frost proof.

2nd. The crop to be ensiloed must be grown to a stage when the several plants will be almost mature.

3rd. The crop to be ensiloed should be put in loosely at first, to permit of quick and sufficient heating.

4th. The filling may proceed every day, every second day, or every third day with equally satisfactory results.

5th. The silage may be covered with cut straw to a depth of two feet. Or it may be left uncovered altogether at the expense of wasting only the top six inches.

J. W ROBERTSON,
Minister of Agriculture, Ottawa, Canada.

Prof. A. J. Cook, of Agricultural College, Mich., In The Rural New Yorker, June, 1890.

Last fall the cut corn was trodden but very little even around the edges of one of my silos, and the silage was entirely sweet and kept with no loss whatever. Is treading necessary? It was covered with about two feet of cut straw and no weights were used. There was no loss. I fed my silage to all my stock very liberally, and was never more pleased with the results. My horses never looked better in the spring than they do this season. If a man has sweet silage—and there is no excuse at this date for having any other—it is all nonsense to say that it hurts horses. It pricks horses just as good oats do. I am going to build another silo the coming summer. I shall build it separate from my barn; it will be octagonal in form, with a diameter of 20 feet. I shall use joists 2x10 inches and shall board inside and out with matched or shiplapped lumber. I shall coat the boards inside with a water tight preparation of coal-tar. I must have silage to feed any time in summer when the pastures dry up. From this I hope, and rather expect to use silage all summer, and so do away with nearly all pasturing.

SILAGE FROM JOURNALISTIC SILOS.

How the Editor and His Patrons Regard the New Stock Food.

Science, News, Practical Thought and Profitable Experience Made Compact with a "Ross Cutter."

DO NOT DISFRANCHISE THE STOCK.

The chemist gives it out that fresh fruits and vegetables are largely water, but the stomach speaks louder than chemistry. Fresh fruits and vegetables are demanded, and are relished. On some farms the root crop does away with the need of silage, but many farmers are not inclined to grow roots. The system of farming ignores them, and many do not have farms adapted. Many of these farmers have taken kindly to the silo and are now providing their flocks and herds with this new food, which at the same time gives variety and serves an end not heretofore attained. A food, often while of low chemical standing, may result in attainment superior to another that is up to the chemical standard. The results of the silo are such that it will be hard to drive it from a place in our lists of feeding stuffs. It may be proved that it is cheaper to dry fodder, but that does not decide the matter. Take away the silo, with its food somewhat like the food of summer, and we leave nothing in its stead on nine farms out of ten at the West. In voting on the silage question, we should not disfranchise the flocks and herds.

"BREEDERS' GAZETTE."

BOOM FOR MILLET.

This crop is an exceedingly valuable one, although, perhaps, because it is so easily grown, it is not popular. Last year a crop of millet was sown in a four-acre field that had been in pasture for several years and had been well-manured. One bushel of seed per acre was sown. The crop grew thickly and tall, nearly six feet, before the heads began to appear, and it was cut before half the heads had emerged from the sheaths. The four acres yielded twenty-five large two-horse wagon loads of half-cured fodder, which was put into a small silo sixteen by twenty and fifteen feet deep. The fodder fed eight heads of horses and colts, two yoke or working oxen, fifteen head of two-and-three-year-old steers and heifers, fourteen yearling and a bull, equal to forty-two head for eleven weeks, and the fodder was eaten greedily to the last without any waste. At this rate one acre would have fed one head for one hundred and fifteen weeks, or more than two years. Then what better or cheaper crop is there than this, which occupies the ground only three months, requires no cultivation, and costs for all expenses not more than four dollars per acre? But it needs good soil, and earlier sowing than usual. DR. HEXAMER, in American Agriculturalist.

IT LOOKS REASONABLE.

I am fully persuaded that the feeding value of an acre of ensilage corn or clover is much more than the same cured in the old way. "Why so", some may ask, "does the silo add anything to the feeding value of fodder?" "No", another answers, "we lose none of the feeding value of fodder by curing; it is nothing, but the water of the plant that escapes". How do they know there is no feeding value lost by evaporation? It is generally conceded that plants draw much of their food from the air; but are we sure that the same material drawn from the air does not return in the drying process? It has been tried and proved that the same amount of green food by weight will go farther, and make more milk and butter than it will after it has been dried. Then again who knows how much of the gummy substance of green food hardens and cannot be dissolve again? I have been a nursery man and know that some kinds of trees can be very much dried, and afterwards soaked up and resuscitated, but if you let a pine, or spruce get dried, the sap gum hardens and can never be softened. Ensilage is

in its natural state easy for the cattle to digest. Which think you would be the easier for one to digest, a dried or canned apple? I think there is just about the same difference between dried cornstalks, and ensilage, as there is between dried and canned fruit.

"FARMERS' REVIEW".

THE RURAL NEW YORKER.

ENSILAGE.

While the widening experience of farmers has put an end to the claims of such writers as Dr. Bailey, it has not prevented the practical dairymen of the country from recognizing the merits and advantages of ensilage. There was a considerable amount of truth in the claims put forth some 20 years ago, by leading dairy-writers, that the "dairy belt" has its limits; although these have proved much wider than those writers thought. Dairying is the child of grazing. It has always begun, and had its strength in well-grassed and well-watered regions. When things "settle themselves", in this continent, it is not doubtful that those parts of it abounding in clear cold, running streams will be the chiefly dairy regions. Grass is the basis of butter. Until lately, all-the-year-round butter has been impossible, as a paying and practical business. It could not be done on the basis of hay, grain and dry fodder. The butter so made not only costs too much, but is too poor. The old perennial exhortation to root growing was based upon a knowledge of this difficulty; but root growing in America has never been a success. Both the climate and the habits of the people are against it. Ensilage solves the problem. It is not going to flood the dairy farmers with wealth, but it is going to make their's a more steady and paying business, and extend its area over the lighter soils, in the well-watered sections.

THE NEW YORK TIMES.

ENSILAGE.

The old practice of fermenting and heavily weighting the silage is abandoned for the better and easier one of leaving the cut corn to settle of its own accord, to cut four or six feet of it daily, tramping it down evenly, and keep on until the mass settles and heats to a temperature of 120° to 140°, when carbonic acid forms and saturates the mass, displac-

ing the air, with all the germs of fermentation and decomposition. When the silo is filled, the cut fodder is covered with straw six or eight inches deep, and this with tarred paper and boards on the top. A load or two of hay may be thrown on the top. This is now the whole process, which has been practiced by several thousand farmers with entire success and so much satisfaction and advantage, that everyone is increasing the capacity of his silos. The advantage of having small deep silos is that the fodder is taken from the top, as it is wanted without any injury to that left until the bottom is reached. The PRACTICE IS SO ECONOMICAL and above all, so SAFE and free from risks, as corn is sure to give a crop under quite unfavorable circumstances, that it is neglecting an opportunity to omit at least a test of it.

THE COUNTRY GENTLEMAN SPEAKS.

ADVANTAGES of the SILO. A doubting farmer asks us what special advantages there are in favor of filling a silo with his corn fodder instead of feeding it dry to his cattle in the common way. In answer the following advantages may be stated: 1. The corn fodder being harvested, drawn in, cut and stored in the silo all in one day, saves the labor and care of putting it in shocks, where it is liable to be prostrated by storms and rotted by rains; 2. The fodder being cut and carried in fresh and uninjured there is no danger of its being spoiled, whatever the weather may be; 3. It is chopped short with the machine with about half the power required for cutting dry fodder; about one-half remaining uneaten and wasted if not cut short, whether green or dry; 4. It occupies not more than one fourth the space in the silo, that is required for storing in the barn in the usual way; 5 The manure from ensilage is short enough to be easily spread over the land, and not filled with long stalks rendering its drawing and spreading nearly impossible until after a year of rotting; 6. It may be brought into the shortest practicable course or rotation if desired, by plowing under a clover sod in spring; sowing the fodder corn on this inverted sod; cutting and clearing all off for the silo by the middle of September, and sowing at once a crop of winter wheat or rye, seeded with clover in the spring. Then there will be only one year between the turning under of the clover crop at the beginning, and the new clover crop started with the wheat or rye. Unlike the common corn crop, the ensilage is required to be cut and entirely cleared from the land in any case, and if the

ground has been kept clear of grass and weeds, an Acme or Cutaway harrow will quickly put it in order for the reception of the grain.

LITTLE MEADOWS, N. Y., March 26, 1890.

THE E. W. ROSS CO.

Gentlemen:—My Ross Feed Cutter has been in use over 30 years and is apparently as good as new, except a breakage which was caused by an accident of a neighbor who borrowed it.

Yours truly,

A. GRAVES.

NEW WRINKLES IN SILOS.

SILAGE IN STACKS.

Trials of stacking silage in the field without the agency of a silo, have been made in a few instances in this country. A stack of silage was put at the Geneva, N. Y. Station with the following result: "The crop thus siloed without a silo was grass. About ten tons, cut green, of timothy, alfalfa and Hungarian grass was piled in a stack fourteen feet square and eight feet high. It was made August 25th to 27th inclusive, the pressing appliance then put on. Fermentation set in at once, and in ten days the mass has settled to a height or thickness of four feet and a half. This was not much of a "stack", and the trial was unsatisfactory on this account. The mass was not great enough, the porportion of exposed exterior surface to total bulk being far too much. On the 30th of September, or only five weeks after making, this stack of ensilage was opened, and the interior was found to be in excellent condition, very slightly acid and much relished by cows. Dr. Sturtevant declared it the most wholesome ensilage he had ever seen. The top of the stack was decayed to the depth of about a foot, and the sides two feet inward, There was also a layer spoiled at the bottom six inches thick. Thus, just about two-thirds of the material was lost because of the small size of the stack. The demonstration of the possibility of thus preserving green food was nevertheless complete.

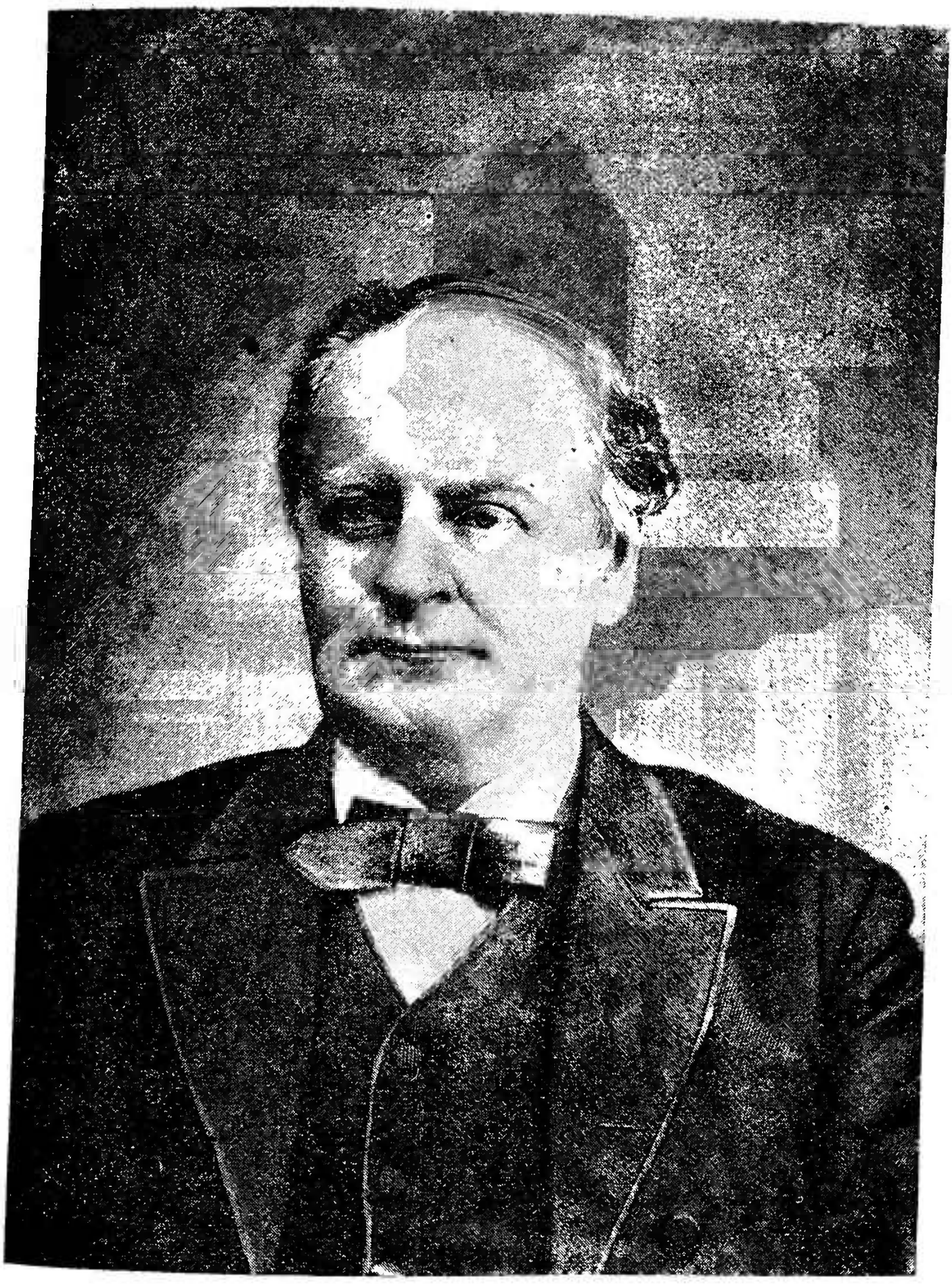
Encouraged in part by the result as stated above, a recent trial has been made, in an even simpler form, by the enterprising proprietor of Millwood Farm, Framingham, Mass. Early last September, just after the first frost, Mr. E. E. Bowditch cut ensilage corn in a field but slight-

ly frost bitten, and made a rough pile or stack of the whole corn plants, in his open field, measuring when done, about sixteen feet square and 14½ feet high. The butts were generally turned outward, and the sides carried up fairly perpendicular, but as it was raining hard during the whole time the work progressed, it was hastily and rather carelessly done. A few days later, a trench was dug around the stack, and the earth from this thrown onto the top of the stack where it was spread out and patted down with a shovel, making it about a foot thick. This was the only weight or cover given to the stack. Thus it stood, steaming at times, drying somewhat on the outside, but apparently rotting within, and gradually settling to about ten feet in height. The stack was opened the last of November, and none were more surprised than Mr. Bowditch and his employes, to find a lot of well-kept forage, which milch cows ate greedily. The loss was comparatively light, the outside being dry, somewhat molded, but very little decayed.

H. E. ALVORD.

THE COST OF A ROUND SILO.

Mr. F. J. Ellis, of Eau Claire, Wis., who, no doubt, has the finest round silo of any man in the United States, sends the following bill of particulars. The capacity of this silo is 150 tons. The bill of lumber is as follows:—for the sill, 300 feet of culls; studding, 640 feet of culls; sheeting, 1,800 feet common lumber; roof boards, 640 feet common lumber, strips, 160 feet common lumber; rafters, 240 feet of culls; circle of deck, and frame for trap-door, 200 feet of culls; flooring for deck and trap-door, 200 feet of clear lumber. In addition to this, sufficient lumber for staging would be needed. The building can be completed, and the roof put on and filled without putting on the outside course of paper or sheeting. The culls at $10 perthousand, cost $13.80. The lumber better than culls cost $42.00. Total bill of lumber, $55.80. We paid $10 to a carpenter to cut out and lay out rafters and make the circle for the deck, and he helped us also in nailing on the studding, after he had completed that work. We paid $10 to another carpenter to work on the building. We used about 6,000 shingles that cost us $1.50 per thousand Total expenditure, $84.80. The balance of the work we did among ourselves.



Yours truly
J. D. Douglas

THE CLEVELAND SILO CONVENTION.

The Central Association has Another Profitable Meeting. A Brief Report of Affairs.

The second annual convention of the Central Ensilage Association was held in the City of Cleveland, Ohio, March 13th and 14th, 1890, with President Jos. Breck in the chair. About 150 silo men, and beginners, were present from widely separate sections of the country.

The first paper was by Prof. J. F. Heckman, of the State Experiment Station, who, in a thoughtful, conservative address, was of the opinion that the silo had a rightful place in farm economy, and as the world moved forward, the silo would move with it. It was the American farmer who had simplified, and so reduced the ideas to practical form, that it was now a system within the reach of about every farmer. His idea was a durable silo, and a crop of less tons, and more substance. He would feed a cow five pounds of silage for each 100 lbs. of weight, and agrees with John Gould about having silage corn get mature. He says silage corn should be planted as early as possible, use large varieties, and allow them to ear. Does not want the stalks too coarse, so plant, say six inches apart in the drills.

Mr. Foster wanted the big stalks. They were the ones that contained the sugar A large stalk with a large ear, cut up, is perfection roughage.

Mr. Battles, of Euclid, Ohio, said that I could not get above 15 tons per acre. I get 50 per cent. more of B. & W. silage to the acre than of other kinds. We set our Cutter where we can drive up close to it, and unload from the wagon directly upon the cutting table. We do not pay much attention to treading the silage. My losses from all sources are

about 5 per cent. The silage makes winter very pleasant as there is no wading in mud and water, "fishing" for corn stalks that remain for months "curing" in the field. I have not thrown out a bushel of rejected silage from the mangers this winter. I feed grain heavily, as I milk, and fatten a cow at the same time.

Mr. Breck.—I feed my grain and silage together, mixed up one feeding in advance, about eight quarts mixed bran shorts and corn meal with the silage, to each cow.

Mr. M. C. Danforth read an excellent paper "My personal experience", and said that cheap food was the prime factor to-day in farming. The silo fever is over, and men now discuss it in a rational way. Those who once opposed, are now building silos. I have used a silo for over six years, and find that I am now keeping better, on the same farm, double the stock I did in 1884, and in fact, at no more expense. The silo is soon to be used as the solution of the question how to summer soil our stock and save the vexations problem of raising crops in succession, which often fails. I am convinced that with silage, stock can be kept at one-half the cost of ten years ago. I think silage can be put in the pits for 25 cents per ton. The milk of my dairy goes to the market without any criticisms.

"Will silage keep over summer"?

Mr. Foster.—Yes. We left eight feet in the bottom of one silo last spring (1889) and left it wholly unprotected until September. There was just four inches that spoiled and under that it was as good as ever. That is the experience of O. Kelsy, Frank Blair, and E. Croys with summer in silage. Mr. Coit, who does not cover his silo when filled, said the loss is no greater without covers than it is with covers.

"Will silage injure horses? The Ohio State Vetenarian says it will"

Dr. Stuart.—' Let me answer. I have the facts about this case. These silage fed horses drank from a creek that was charged with copperas and other mineral matters which came from a coal pit, besides the drainage from pig-pens, and washings from roofs and barn-yards. The treatment of the horses as described, was turpentine and chloride of mercury, five times a day, as an antidote for poisoning. Now we see plainly that ensilage played no part in the death of those six horses, that they cannot substantiate any deleterious effects of ensilage in this case. The death was caused by drinking poisoned water, and the antidote used was not adapted for the purpose, but aggravated the case"

Dr. Stuart then gave a paper on "Facts in favor of Silage" The first fact is that there has not been a complaint about silage injuring the health of animals, where there is a constant source of loss in feeding dry stalks. Another fact is, that silage is the best winter roughage for cattle, and in summer, a feed of silage each day gives the cattle a chance to choose between starvation, and being consumed by flies. Silage is better than the ordinary fall feed. Another fact is, not a man who has a silo abandons it, and yet another fact, that silage increases the flow of milk, makes finer mutton and lambs, juicy beef and a most excellent feed for colts, as all silo men testify to.

Mr. Breck.—I find that where I let the fodder lay on the ground to wilt, I do not get as good silage. I draw now and fill silo as fast as cut.

Mr J. W. Pierce.—This last season we burned a pit of corn cobs into charcoal, and I sprinkled this coal dust over the silage as it was cut into. By this plan the silage does not have any 'limberger" odor. The stock does not object to the charcoal. We put on a peck of charcoal to the ton of silage. We put up both corn and clover. Think that the two mixed are better than either fed alone We alternate our second crop clover and corn fodder as they go into the silos.

"Is it best to tread the silage"? was ably discussed. Some loss in the corners and sides was reported. A number present insisted that they paid great attention to sides and corners and yet l ad trouble, and to prevent this should tread yet harder in the future. It was significent that while there are expections, the greatest loss in silage in corners and sides comes from those who are the most strenuous advocates of a great amount of treading. If there is loss with treading, why tread yet more? The general verdict of many experiments is that silage should only be slightly tread and allow all the air possible along the walls, to promote as rapid heating at the walls, the same as in the center.

Mr. Talcott then read a paper on "Single ceiled Silos", and gave his views at length. He contended that the single board lining was as good; that it was a waste of money to use twice as much lumber as was necessary; that the single board would dry out, while the double boarded one could not; that one board would protect silage as well as two, and that the lathed and plastered silo was not much superior to the stone pit; that yellow pine is the best material, and that such a silo will last for years. When a pit was once opened the feeding should be continuous from it to keep the silage in a prime, fresh condition. "I do not feed grain when I feed silage to my stock, nor do I feed dry fodder."

I think the silage should be fed warm for the pit. It will induce a larger flow of milk. I cannot make as fine butter from dry hay and grain as from silage alone.

The question was raised, "If we feed all silage, what shall we do with the hay"?

"Sell it to pay the hired man" was the reply.

Another man said, "Do not plant corn for the silo that will sucker". "Suckers" have no sugar and the sustenance they require detracts just so much from the parent stalk. Each year adds new experience, shows a greater economy in silo practice, and as the years go by, we find the silo cheaper, the food better and the expense less, until it is now stated on good authority that in 1888 Mr. Henry Root, of Mantua, Ohio, cut in the field, and filled into the silo, 520 tons at a cost of 18 cents per ton.

Prof. Hickman.—I am asked if more food comes out of a silo than went in. Yes; as compared with the same crop dried; more palatable, in better condition to be fed, and is easier of digestion. The chemist says, so much of carbon and so much of this went in, and so much came out; but the point of the chemical changes that has taken place in this carbon, &c., and how the animal thrives upon the one and the other, is a matter undergoing investigation. The practical men will at last have to decide the matter as if no chemist had existed or investigated.

Clayton Hall.—The best silage is made from B. & W. Plant early, apply fertilizers well, plant 8 quarts of seed per acre; build the silo according to your pocket-book; cut the silage into half inch lengths. A foot of chaff is as good a cover as any. Cut the corn in the field in 500 pound piles before commencing to fill the silo. Have the corn well-matured; that is the secret.

B. A. Robinette.—If we could keep our corn fodder so that we could have it in March and April as good as it was in October, we would be foolish to build silos, but we can't do it, nor can we cure corn fodder as Prof. Sanborn suggests. It would take a barn covering ten acres, to cure the fodder of some Ohio silo men. Our fodder this year, left in the field until January 15th, lost one-half of its feeding value. The man who feeds out of door saved fodder, as against good silage, is working for about nothing, and losing the fodder besides to a very great extent. There is great satisfaction in getting the forces together in the fall, making a few days' rush, and fill the pits, and then have all the fall for other farm work, and not encounter the rain and mud of an all the falls work; husking, cribbing corn, and stooking fodder. No feed will so

well contribute to our stock as silage, and I speak from the stand-point of a winter dairyman.

S. P. Thompson, of Hudson, Ohio, related his experience in building and filling a silo last season. He found silage fed to his winter dairy of 40 cows increased their milk, over 20 gallons per day, was better than hay or dry fodder besides cheapening the cast of the milk, had made it possible for him to add fifty per cent. to the stock upon his farm.

After a great deal of discussion upon various points brought out by the various speakers, words of exhortation and advice, making strong, the weak, confirming the faith of the others, the meeting adjourned.

THE WISCONSIN SILO CONVENTION.

WORDS OF COMMENDATION.

At the Plattville, Wisconsin, Institute, March, 1890, a day was given to the discussion of the silo question. The first paper was by Leslie Adams, Farm Superintendent of the Wisconsin Experiment Station, who said: "It is not so much now, will it pay to build a silo as, how can we build and fill to get better results. But this we know, that with the silo we can preserve our corn fodder in a way that we cannot do by any other means. Ensilage comes the nearest to taking the place of green grass in the winter time of any feed we can give our cows, and as you are well aware that the butter comes quicker and nicer in the summer time, when the cows are on pasture, than in the winter when they are on dry feed, you can understand the effect that the ensilage has upon the cows. Let us consider the ensilage question in connection with beef production. Eight steers were divided in two lots of four each and were fed for 36 days. The first lot were given 7,898 pounds of ensilage in all; it was mixed B. & W. and a flint variety of corn; that is, they were fed 55 pounds each daily and they gained $1\frac{1}{2}$ pound daily. The other lot of cattle ate 3,502 pounds of ensilage, which was nearly 25 pounds each daily, together with $14\frac{1}{2}$ pounds of shelled corn, six and three-fourths pounds of bran, and gained $3\frac{7}{10}$ pounds each daily Four hogs ran with the steers getting the corn, and by feeding 92 pounds additional to them they made a gain of 100 pounds Therefore, to make 100 pounds of gain from ensilage, we have 3,558 pounds of ensilage at $2 50 per ton, $4.44. To produce 100 pounds of gain of steers and 100 pounds of gain with hogs, required 669 pounds of grain at $15 per ton, and 654 pounds of ensilage at $2.50 per ton, or a total of $5,82.

If we allow that an acre of land will produce 25,000 pounds of wilted ensilage, such as was used in these experiments since 3,558 pounds made 100 pounds of gain with the first lot of steers, an acre of ensilage will give over 700 pounds of gain. So much for experiments regarding ensilage and dry fodder. Now what other advantages does the silo offer over the old method of curing fodder and stacking it, or leaving it in the field, as is the ordinary practice. The first great advantage is this, the silo enables you to take the green crop and preserve it one year the same as another. Can you do that when you undertake to cure your corn? When fodder is stacked there is a loss equal to that which takes place in the silo. Last fall we took a shock of corn cured in an excellent manner, and after taking a small sample of it for chemical analysis, we wrapped the remainder up in a sheet, so that it could be no possibility be mistaken, and we put that shock in the center of a stack, where it was not exposed at all, and where it remained for five months We took it out a short time ago and cut it all up and took another sample for chemical analysis and found that the loss of feeding matter in that shock was 22.6 per cent., while we only allow about 10 to 15 per cent. loss in the silo. On the experimental farm, some cows were fed ensilage and others dry fodder. I noticed that there was not nearly as much corn in the excrement behind the cows being fed ensilage as in that behind the cows being fed dry fodder. I saved droppings for twenty-four hours behind the cows and found by washing and analyzing that ten per cent. of the grain fed to the cow kept upon dry fodder was being voided, and not one per cent. of the grain was undigested when fed upon silage.

The latest experiments in this silo question are to this effect, that the only advantage of heating in the silo is in aiding to exclude the air. When the mass begins to heat up you at once begin to see it settle down and pack, and when it is undergoing the settling process the air is going out of it, and the more that we can hasten that settling and the tighter we can get it, the more air it will expel and the better ensilage it will be.

Weldon Van Kirk said: "After three years of personal experience and after having an opportunity of hearing the ideas of scores of men of more or less extended experience, we have arrived at the conclusion that no farmer has any use for the silo who ordinarily has more fodder than he can dispose of to advantage with the stock that he keeps; who always has hay to sell and straw to be trampled under foot, and who

thinks corn stalks are not worth cutting, and allows them to stand in the field and turns the cattle in for a few days after husking; whose cows habitually dry up in the fall and remain so until spring, spending their days rustling around the yards and their nights tied in cold stables. We consider depth in a silo desirable, first because the silage settles more solidly and enables us to store a greater quantity in a given space, and second, there is a smaller percentage of the whole damaged by exposure at the top. About one-half of our last summer's make was of mammoth sweet corn and while it is not as sweet silage as we wish it was, yet it certainly is richer than that made from the B. & W. corn. We have not found it necessary to feed so much of it, nor so much grain with it as with the B. & W. We put clover in the silo last year and it made excellent ensilage; we put it in this year and it didn't keep so well. I think this was the cause of it; it is more difficult to exclude the air when a silo is filled with clover than it is when filled with cut corn. It doesn't pack so closely, and to overcome that we will have to put the clover in a little greener in my estimation; say, when it is in full bloom, then weight it a little heavier than we would corn and let it settle."

Mr. C. P. Goodrich, the noted dairyman, said in continuation: "I found out as soon as my butter made from the silage began to get into the Chicago market, the commission men voluntarily wrote to me, and said: "The flavor of your butter is splendid, and I was able to raise the price two cents a pound in a very short time. That satisfied me; that is what I am after; it makes no difference whether anybody that sits at my table can eat it or not" Now, there has been butter injured by feeding ensilage, there is no question about that. You feed damaged, rotten, bad smelling ensilage, and you will get damaged, rotten milk. Some men have told me it didn't make any difference, but I have turned away from them for they do not know anything about it. You feed good ensilage and it makes better flavored butter that can be made from dry feed. I not only know it, but the customers in Chicago know it, and that is the point I am after".

H. C. Thom, Dairy Commissioner, on being called remarked: "Two or three kinds of corn are not necessary to put in a silo. One is enough. The place for a silo is in the barn. The cost to me of building a silo that holds 250 tons is $112.60. If you haven't anything else to cover with, cover with straw, run it through a machine and weight it. More damage is done to cattle by over feeding silage than we suppose;

45 pounds is enough for a cow, and 50 pounds is enough for a two or three year old steer. Exclusive feeding of silage will taint the milk. The kind of corn to put in a silo, in my opinion, is the kind of corn which will produce the largest stalk that will get ripe. If we could raise a kind of corn that had no ears on it, it would answer the purpose of dairymen, I am sure, and I know it would those of beef producers. The function of a silo is to take the place of pasturage, which we get in summer, in the winter time. There is more danger of losing silage from putting it in too late than from any other one cause. It will dry from top to bottom if put in too late. If silage is put in too green it will inevitably turn sour, and we don't want it.

C. N. Beach said: "We find no bad results from feeding silage made from Yellow dent corn. We feed it in connection with bran and hay, about forty pounds a day of it, with ten or twelve pounds of bran, and upon it the cows fresh in milk will give a pound of butter a day for 200 days. We like it and don't know how we could do without it. On a farm of seventy acres we have wintered for three winters, forty cows This year we shall have 30 tons of hay left over. Under this system we can harvest an acre of corn cheaper than by any other possible process. The corn is thoroughly digested, the cows like it and give large quantities of milk; the butter is good and everything satisfactory".

ALBERT J. COOK, M. S.

Professor Natural History, Michigan State Agricultural College. Also Prominent Farmer.

THE TESTIMONY BY STATES.

During the past year hundreds of letters have been received from nearly every State in the Union, giving with more or less detail, the writers' success with the silo, and its benefits to them. From this great array of evidence, we have, almost at random, selected the letters that follow as testimony for the "unconverted" Not that these were the best, for all were conclusive upon the main issue. But the limits of the book made condensing necessary. There is a wide display of opinion and practice, but the end attained, singularly is almost unanimous touching the value of silage as a food for stock, and the cheapness with which it may be raised, stored and fed. The testimony of 1890 is almost a reiteration, but the story, even if told and re-told, is but the way in all past time, great teachings, truths, and reforms have gained the "ear of the world" and resulted in a gain for food and progress.

TESTIMONY FROM MAINE.

BANGOR, ME., Feb. 22, 1890.

THE E W Ross Co.

I have a silo holding 500 tons, built of hemlock studding, lined on the inside with pine boards. We find that a silo can be built at a cost of from $10 up to any amount a man may elect. Ours is built in one part of our big barn. We use corn exclusively for silage, and estimate its cost in the pits at $1.15 per ton. We do not use any weights, nor very much covering. We commence to cut our silage as soon as the corn commences to turn. We begin feeding at once. The silage is fed to 30 cattle, and 200 hogs, and their condition is fine, and we consider good silage far superior to any dry feed we have had any experience with.

Yours truly,

F. O. BEAL.

BIDDEFORD, ME., Feb. 24, 1890.

THE E. W. ROSS CO.

Yours of the 22nd at hand. Would say I have been using ensilage five years. My silos are cheap, built with stone under the sill. From the sill to the high beams, double-boarded and paper between. Capacity, 100 tons, which I grew on eight acres. I am very much pleased with the silo, and would not think of doing without it. I keep 18 Jersey cows, make butter altogether, for which we get 35 cents per pound. We feed one feed in the morning and one at night, with a small amount of grain, and one feed of hay at noon. We use Blunt's Ensilage Corn. It takes about five days to fill our silo We cover immediately with double boards and shovel on a layer of dry sand. We do not lose any silage to speak of. We feed silage until the last of May. On silage our stock gain in flesh all winter. I estimate that our silage costs us $1.50 per ton. I use a Ross Cutter and call it a most complete machine. Quite a number of our best farmers in this vicinity feed silage with the very best results, both for butter making and for milk.

Yours respectfully,

D A. BURNHAM.

Elmwood Farm, PARSONSFIELD, ME., March 17, 1890.

THE E. W. Ross Co.

Gentlemen:—In reply to your inquiries as to my silo, its construction, &c. I will answer as briefly as possible on the different points.

I have a cellar under my barn 10 feet deep of which I took for my silo two bays, each 12½x14 feet. When finished, their dimensions were 12x13½ feet. I made two silos, one for each bay, from the bottom of the cellar, to the first girt in the barn, thus making the entire depth 19 feet. This season I shall build each one 9 feet higher. The material used in construction was joists, 3x3 inches, boarded with any common inch boards which were covered very carefully with tarred paper. This I boarded with good, sound pine-boards, using care to break joints as in shingling. Great care should also be used in bracing and staying to prevent spreading. The bottom was cemented, making all air tight from bottom to top, which is the essential point.

The whole cost will not be more than $100 as a great portion of the labor was done by my farm employees by odd jobs, and during stormy weather. Now I have as good a silo as any one, as the contents came out in perfect condition. Only two inches on the top were turned dark

and even this was all eaten by my cattle. I used a Ross Cutter, putting in 25 tons per day. First one was filled, then the other, but a better way I think, would be to put into one on the first day and into the other the next, thus continuing until both silos are filled. This being done I put on oat straw to the depth of about a foot. I opened one silo on Nov. 10th and commenced feeding my stock (32 in number and of different ages, from calves to three-year-old steers, and cows), giving on an average, one bushel a day to each animal. My method of feeding is as follows: At morning feed twice on silage, one basket to three animals each time. At noon, feed once on unthreshed oats. At night, feed once on oat or rye straw, and once on silage, one basket to three, thus getting in the bushel to each animal. In addition to the corn in the silage, my steers and cows have had for grain, three quarts of shorts, and the calves have had a little oats added with shorts a part of the time. They have made a better growth and are in better condition than ever before at this season of the year.

I am unable to speak of the merits of silage as food for dairy stock, as my business is stock raising both cattle and horses. I am perfectly satisfied with silage as a cheap and abundant food for young and growing animals. I am satisfied that with the silo I can double the carrying capacity of my farm. I figure the cost of silage at $1.75 per ton, which is about as low as it can be produced upon our New England farms. I value 2½ tons of my silage against one ton of best hay.

Respectfully,

J. W. COOK.

FROM THE GRANITE STATE.

HAZEN'S MILLS, N. H., March 1, 1890.

THE E. W Ross Co.

Gentlemen:—Answering your inquiries, I would say that I have a silo 52x32, and 28 feet deep, built into a bank. There is a stone wall against the bank, but the silo is built up inside it. I think this silo all complete cost nearly $1,200. We at first, in filling used heavy weighting, but now I do not use any, as it is not needed with deep silos, unless the fodder should be very dry. I plant B. & W Sanford's and White Southern corn, some eared and some not eared. My silage costs me about $1.25 per ton I winter 125 head of stock, 75 head of which

are cows. They have no other hay, nor have they had for four years. I can keep cattle better on all silage than on the best English hay. I now feed to horses, giving 12 of them each a ration with very satisfactory results. I use one of your No. 17 Cutters and cut a ton in eight minutes with it.

Yours truly,

L. T. HAZEN.

MR. SANDERS GIVES HIS VIEWS.

LAKE VILLAGE, N. H., March 7, 1890.

THE E. W. ROSS CO.

My silo is a plank one, cost $100, and is 24x16x20 feet deep. I cut my corn in the field with a one-horse mower, a row at a time. When the silo is filled, I put on a cover of cut straw, some planks and weights. I use Leaming corn which will mature here by Sept. 1st and bears a large percentage of ears. We like the ears to glaze before cutting. I am satisfied that sour silage comes from poor, *immature* fodder. I plant as early as the ground will admit of. I think that rain on silage would cause it to sour in the pit. I let silage wilt a few hours before drawing. I am usually two weeks filling my 150 ton silo. Our stock does much better on silage than they ever did upon hay.

Yours truly,

GEO. W. SANDERS.

VERMONT.

WARREN, VT., Feb. 25, 1890.

THE E. W. ROSS CO.

Dear Sirs:—My silos are built in bents of barn, double-boarded with tar paper lining. They are 16x14, 16 deep, and built of hemlock lumber and cost $50 each. We fill with a "Ross" Cutter and an Engine. Shall put up 250 tons next year as I want more silage. Opened silo Oct. 1st and began to feed at once. The cost of my silage for land, plowing, seed, planting, fertilizing, cutting, &c., was $1.25 per ton. I figure eight tons to keep a cow eight months. With good silage, and 100 quarts per month of good middlings, cows should keep in fine condition. No better food for good milk, or fine butter can be fed than silage.

Yours truly,

WARREN V. HOWARD.

EAST HARDWICK, VT., Jan. —, 1890.

Dear Sirs:—I have had a silo several years. The second year that I filled my silo, frost came before I cut my corn. When I cut it into the silo, it looked as though it was almost worthless; leaves white and withered. But the heart of the stock was green, and when cut and put in the silo, moistened the leaves. The cows ate it greedily, and did nearly as well as before. I put in some whole oats. The cattle picked out the heads and left too much straw. They were hard to get out of the silo, so I did not like that way, but the cut oats did well, and made as much butter, but not as much milk, as the other ensilage. The third year frost came so early, and so hard that I thought it would not pay to cut the corn into the silo, so cut and shocked it, and fed it dry. Three-fourths of it was wasted, and I lost much by not cutting it into the silo. To sum it all up, I think corn the best of all our crops for ensilage, and the nearer the glazing stage, the better. Cut with the ears on makes a cheap feed, and will not need much grain to make cows do well. They do not want a large ration and nothing else. I feed a half bushel of ensilage night and morning, to each cow, and a little hay, all the time. It will pay and the feed will be good, if the air and frost are kept from the pits. The silo should be near by the stable. Stables should be warm so that nothing freezes in them. The cattle will then enjoy summer weather, in the barn, and will have the appearance and laxative condition of pastured cows. Of course, cows so cared for, should never be left out in the cold of winter. Neither should they stand in cold winds to drink. It will pay well to have a tank of warmed water for them to drink from.

W. D. BRONSON.

RANDOLPH, VT., March 18, 1890.

THE E. W. ROSS CO.

Gentlemen:—Yours of the 3rd inst. at hand. In reply will say my silo is made of spruce boards matched and fastened to timbers, so that the boards are in an upright position. Size, 8x12x12 feet. As the silo is built in one bent of the barn, the timbers were nearly all there, making the cost of building silo very small, not over $10. I filled it with Sanford and common yellow corn, three loads of the former to one of the latter, all out of the milk, cut ½ inch in length, two teams drawing from the field and one team cutting, I cannot say how much the actual cost of the ensilage was for I kept no account with the corn-field. Probably not over $2 00 per ton. I should judge it was not over six

weeks from the time of filling before the silo was opened. I fed six head of cattle 2 bushels per day each, for nearly two months, besides feeding 2 bushels per day to pigs the same length of time The stock did fully as well on ensilage with no grain other than what was contained in the ensilage, as I have ever had stock do on good hay and a grain ration. I did not use any weight, and think that therein I made a mistake, as my silo was so shallow the weight of the ensilage did not press it sufficiently to keep it from being injured on the edges and on top. I know of others who did not weight and feel satisfied about it.

Yours truly,

L. J. HARRINGTON.

Office of the New Orleans City and Lake R. R.
New Orleans, Feb. 10, 1890.

The E. W Ross Co., Springfield, Ohio.

Gentlemen:—It is with pleasure, that we, in replying to your favor of Jan. 30th are able to state that we have been using one of your Giant Cutters No. 18 A. for nearly two years in our Canal Street Station, where it daily cuts hay for about 1,000 mules. The Cutter is strong, simple, well-made and durable, and runs as smoothly as it did the day we started it. We have cut 400 lbs. of baled hay per minute, and this is at the rate of 10 tons per hour. Our average work is about 6 tons per hour. We have used many cutters, but none of them can compare with the "Ross" for strength, durability, simplicity and capacity Before we purchased your No. 18 A. Cutter, we employed a special set of men to run the Feed Cutter. Now these men are able to work about the stable, as they only run the Cutter about four hours per day to supply our stock with cut hay.

Very truly yours,

F WINTZ, Superintendent.
F. C. WINTZ, Foreman.

SILOS IN THE BAY STATE.

[Chas. Robinson & Son make an exhibit.]

Barre Plains, Mass., Feb. 24, 1890.

The E W Ross Co.

Sirs:—Our silo is built as an annex to our barn and is built of stone and wood. It is 28 feet long, 12 feet wide and 22 feet deep The base for ten feet is stone cemented, and top portion of wood, and cost $400.

We have used it every year since built in 1884. I consider it ABSOLUTELY necessary. We use either sand put on loosely, or stone for weight. Prefer sand loose, and use the same afterwards for bedding. We aim to hav the corn glazed, or in full milk to be in the best shape for food. We estimate we put in 175 tons, and commence using about two months after filling. This year we put in corn and rowen on the top. The cost is not over $1.00 per ton. We feed 100 head of Holsteins and the condition of the cattle is fine.

Yours truly,

CHAS. ROBINSON & SON.

THE PROFITS, $103.

NEW BEDFORD, MASS., March 4, 1890.

THE E. W. Ross Co.

Gentlemen:—My experience with the silo has been a PERFECT SUCCESS. There are ten silos in my neighborhood and more will be built this year than ever. The best silos are built of wood, double-boarded inside, with tarred paper between these boards. I like the silo two inches larger at the top than at the bottom, as I think the silage compacts better along the wall than when straight up and down. The out-door silo should have a dead air space. I built my silo 10x12x20 feet deep and it cost me $75 00. I now use steam-power to fill with, and find it much cheaper and more expeditious. For weights, I use a couple of feet of litter, bank it up high in the corners, and set a barrel of sand in each of the corners. Corn must be glazed to make good silage. I find the silage gives me one-third better results than the same fodder dried. It cost me 50 cents per ton to raise and put up ensilage in the pits. My silage this year is feeding at the rate of seven cows to three acres. These three acres last year produced three tons of hay. I figure the profits of these three acres in silage over hay at $103.00.

Yours truly,

HENRY HATHAWAY.

HEMLOCK & SPRUCE FOR SILOS.

SOUTH DEERFIELD, MASS., March 25, 1890.

THE E. W. Ross Co.

Gentlemen:—Our silos are of wood, strong frames, with well-locked corners. They are double-boarded inside with tarred paper between; boarded outside to give air space. We built of sound No. 3 boards.

Hemlock, or Spruce is good for the silo. The silo should be large enough to hold all the silage a man needs. Our silos cost about $100. The cement bottom is a matter of choice. We cut our corn before the lower leaves begin to fall, and cut ½ inch long. We continue to use heavy weighting, and we open in about two months after filling. We use both corn and clover for silage. Our stock winter well on silage, and we are fully satisfied with it.

Yours truly,

E. P CLAPP.

FROM THE EMPIRE STATE.

[From Dairy Commissioner, J. K. Brown].

ALBANY, N. Y., April 8, 1890.

THE E. W. ROSS CO., Springfield, Ohio.

Dear Sirs:—In response to yours of the 3rd inst. permit me to say that our progressive dairymen have given the subject of silos careful attention, and hundreds of new ones are to be built this season. Old prejudices are fading out and the silo is now regarded, by our most intelligent farmers, as a necessity. In fact, it is difficult to see how dairying can be made at all profitable in our climate, without a good, well-filled silo for winter use. Our experience has not been as extensive as that of some others, but so far we have found it all that its most enthusiastic friends claimed it to be. The silo alone will not make a dairyman rich, nor add largely to his income, but by having the large quantity of cattle food which can be cheaply provided by using the silo and then by feeding such cheap products as wheat, bran, middlings, &c., he can profitably keep a much larger herd, and steadily and surely increase the fertility of his farm. I believe the silo to be a good thing for both the farmer and the farm.

Yours very respectfully,

J. K. BROWN.

ONE-FOURTH MORE BUTTER.

RODMAN, N. Y ——— —, 1890.

THE E. W ROSS CO.

Gentlemen:—I built a silo last season. Its dimensions are 24x30 feet, and 25 feet deep; capacity 300 tons. It is built of stone to a height of 13 feet: remainder of wood, and cost $800. I planted eighteen acres

of corn mostly of common field variety, which yielded an average of 12 tons to the acre, very rich in grain. I consider two tons of ensilage as worth one of hay. Filled my silo very slowly, giving ample time to heat. Opened one-fourth of silo Nov. 1st. Found the ensilage in prime order, being perfectly sweet, except two or three inches next to the wall. I am feeding milch cows, 45 pounds per day, in three feeds, with from three to four pounds of hay, and two pounds of ship stuffs. Am making one-fourth more butter on this feed, from the same cows, than I did last winter, when I fed 12 pounds of corn, oats and wheat, ground and mixed, together with all the good hay the cows would eat. Have a dairy of 20 cows, mostly fresh; never had them do so well. Ensilage is a success with me so far, and I do not think any dairyman can afford to do without a silo.

N. D. RALPH.

J. E. RODGER'S EXPERIENCE IN "ALL THE YEAR ROUND" FEEDING SILAGE.

BINGHAMPTON, N. Y., April 21, 1890.

THE E. W. ROSS CO.

Dear Sirs:—Your letter received, I am glad to answer your questions so far as I understand the facts wanted. We feed ensilage to our cows the year round. We keep an average of about 100 head or more in the winter, and less in the summer. Our stock is in fine condition. We turn from 30 to 40 head each year for beef, which are fatted while we milk them. We allow our best cows to come in, with us. The grain ration for the past two years has cost us for cows for the year, $25.53. The grain is gluten meal (in damp state) and cotton seed meal. This grain ration and about 50 pounds of ensilage per day has produced in 1888, 3,041 quarts of milk per cow for the year as an average of our dairy. In 1889 the average per cow was 3,175 quarts of milk. This year we hope to make it 3 300 quarts per cow. I know of no dairy of native cows that has, on dry feed, produced this amount of milk. Our cows are not pastured, the feeding of silage being continued throughout the year. Our average yield of corn is about 18 tons per acre. We have settled upon the Leaming corn as the best for this locality. We use 8 quarts of seed per acre. Our silos are 30 feet square inside, and 24 feet deep. We fill as fast as we can, putting in 70 tons per day. The silage is sweet to the smell, but somewhat tart to the taste. There is some loss from several causes, possibly 15 per cent. From our experi-

ence no man has any business to pasture land worth from $50 to $100 per acre, or land that will produce 15 tons of silage corn per acre. The silo we find enables us to keep three times the stock that we could on the old plan. Very truly yours, J. B. & J. E. RODGER.

FROM T W. SKINNER.

MEXICO, N. Y., April 4, 1890.

THE E. W ROSS CO.

Gentlemen:—Last year, having bought the old homestead where I helped my father clear the land over 50 years ago, I was told by my neighbor that if I made a success of farming in these times I must build a silo, and raise corn enough to fill it. As the farm is what is called a dry farm, not adapted to grass, I at once set about building a silo, by changing a 15x30 foot bay into one, first laying a good wall with mortar up to the sills, about two feet. Then put in sufficient girths between the posts to make it strong. I then boarded it up all around on the inside with hemlock boards; then a coarse of heavy tarred paper, then another coarse of hemlock boards. I had a partition in the middle, making two silos of 14x14 each. These opened by doors upon the barn floor, from which the ensilage is fed to 20 cows who stand about the silo in the form of an "L" The cost was less than $100 and was filled with corn cut with one of your No. 14 A. Cutters. The power being a four-horse Sweep, also bought of you. Only three horses were used. The corn was drawn and silo filled gradually as a man would do his other farm work. No weights were used. When filled a quantity of swale grass was cut and put on top. The corn was well-glazed. Each silo would hold 60 tons and one was opened when the cows were put up for winter. Four kinds of corn were planted, to wit: Pride of the North, Selzer, Southern "Soo" and Sheep Tooth corn. The Pride of the North was the only one that had ears of any amount, and another year shall plant Pride of the North, and the Improved Leaming. As the work was all done by man on farm and without hiring, I could not give the expense per ton of storing the ensilage. I am feeding 20 cows and they have hay once a day, and are in fine condition, and will give more milk on ensilage than on dry fodder. The No. 14 A. Cutter and Horse-Power are just the things to have on a farm. A farmer can cut his ensilage at his leisure and also his corn stalks and straw in the winter. Yours truly, T. W SKINNER.

PENNSYLVANIA.

Important Testimony from Edgar Huidekoper.

MEADVILLE, PA., April 4, 1890.

THE E. W. Ross Co.

Dear Sirs:—In reply to your letter, I did not weigh my corn fodd as it went into the silo, nor did I keep accurate account of the amou put up of the different lots, but I know some things about it which, not concerning details, is concerning general results. My ensilage co had to be planted a second time (B. & W. corn.) The second planti was on May 20th. It grew well, made a great crop; seven and a h acres of it filled a silo 19½ feet square, 16 feet deep, but it was not suf ciently mature Sept. 26th to 31st to make the best of ensilage. On O 7th we began putting the balance of B. & W. corn into new silo and th lot comes out better. Sept. 23rd, 24th and 25th my men cut up son field corn which was husked later. After getting the B. & W. corn in silo, the men cut up all the field corn on Oct. 4th and 5th and shock it Oct. 7th. They began putting this into the silo and it made extr ordinary fine silage It came out amber color, sweet and in splend form. Then we were delayed until Oct. 21st. On that day until th 24th we put into the silo the field corn that was shocked up Sept. 25 part of it being husked. This silage came out of the pits this winter a darkened state as to color, but it fed well. During the filling of th silo we sprinkled it down with several barrels of water. There w some loss, but not much in the aggregate, mostly at the top and co ners. This was due I think to insufficient treading and not enou wetting, which would have produced more heat and so secured bett settling. I do not think the loss so great as it would have been if I h left the corn stalks in the field, or tried to house them some other wa Much of the B. & W ensilage corn had splendid ears ready for tab use, but I was satisfied the corn should be ready to husk to give best r sults, and I would prefer to cut some of the field up, and shock it th to put it in before it gets to the husking condition. This season I pr pose to plant several kinds, B. & W., Yellow Dent, Leaming, &c., a keep the B & W. to cut into the silo along with the dryest towards th end. I think the B & W. being green will have enough water to spa some to the dry stalks which will go in, with alternate loads, and th

be an advantage to both, and the dry will not require to be sprinkled. But the season and condition of corn crop will determine me in some respects when the time comes. I think we should put oats into the silo to save buying bran, and see if this expense cannot be avoided. When we were putting the field corn into the silo, my neighbors thought me a a fool to spoil such a splendid crop, but they now admit it was a good thing. This season I shall put enough ensilage to feed from August to June, and put the silo to a further test and see if it is the best way to soil my stock. Yours truly,

EDGAR HUIDEKOPER.

PHILADELPHIA, PA., Feb. 24. 1890.

Gentlemen:—I have used ensilage for the past ten years with good results. My silo is built of stone on a side hill, filling on the upper side, and taking out on the lower side. The inside and bottom are cemented. The bottom has an incline to the extreme end with a small dish in the ground for any juices that accumulate to run off. The walls are 16 to 18 inches thick, well-laid in mortar. When thoroughly dry, put on the cement, two layers, after an interval of several days (each layer.) I use Southern field corn planted in drills, and when the ear is in the milk, cut and fill leisurely, treading down as filling. After nearly full, let it settle three or four days and then fill up above the plates on wall and let it settle until even with plates; then put on a layer of chaff corn with plank and put a few good-sized stones on each plank. As you take out the ensilage at one end, cut it down as you would hay, and place the plank and stone on plates to be ready for another season. I feed to my milch cows, two rations a day of a half bushel each, mixed with one quart corn-meal and three quarts bran, well-mixed; one ration of hay at night. My cows come out in the spring with a sleek coat and in fine condition. I consider ensilage a fine food fed as above. I have written more fully than I anticipated when I began this letter, as I have had a long experience in this feeding, having a dairy of 125 cows. I take great pleasure in giving my testimony in favor of ensilage.

Very truly yours,

J. E. KINGSLEY.

FROSTBURG, PA., March 15, 1890.

THE E. W ROSS CO.

I shall only speak of what I have learned by actual experience, extending over five years, during which time I have spent considerable

time, labor and money, with diversified results. In this essay I shall only give you the conclusions at which I have arrived, and by which I expect to govern my practice in the future.

I think I can raise 10 tons of ensilage on the same land that would produce one ton of good hay.

Two tons of ensilage have a feeding value equal to that of one ton of good hay.

All kinds of stock will eat ensilage in perference to hay.

A ration composed of two-thirds ensilage and one-third dry feed and grain will keep stock in as good condition as it is possible to keep them on dry feed, and will not cost half as much money.

All farm stock will eat a good ration of ensilage daily for any desired length of time without becoming tired of it or experiencing any bad results therefrom.

I have fed it to cows in all stages of gestation without any evil effects.

The silo may be filled fast or slow, as is most convenient, and the ensilage harvest may extend through several weeks if so desired.

Feeding may be begun in six weeks from time of filling the silo, or may be deferred any length of time desired.

Ensilage is as good feed in summer as in winter, and is therefore a safeguard against frost or drought.

The feeding value of a crop is not increased by being placed in a silo; but is preserved in succulent, palatable form, and stock will do as well when fed good ensilage at any time of the year, as they would do if fed a like amount of the same crop when in the condition in which it went into the silo. This fact enables the farmer to provide for his stock a supply of feed sufficient to last the entire year, and answers the same purpose that pasture does during a few weeks in summer. It also gives all the advantages of soiling in summer, without the objectionable feature of having to cut and haul in the needed supply each day, regardless of condition of weather or pressure of work.

JAS. McCRACKIN, Jr.

MR. CHASE BELIEVES ALSO.

Meadville, Pa., March 11, 1890.

The E. W. Ross Co.

Gentlemen:—In reply to your letter would say I have used ensilage three years with success. I built my silo inside the barn, 12x16

feet, and 20 feet high. I used second-class hemlock lumber as lining, covered with tarred paper and then sealed up with hemlock flooring and painted with coal-tar. I use a Ross Cutter with Carrier and can cut as fast as two teams can draw the fodder from the field. Do not use weights. I use B. & W ensilage corn and cut it as late as frosts will admit. I have three silos and open from one to three or six months after filling, I feed forty cows and they keep in good condition with little grain. Have used a Ross Cutter three years and like it. Please send me your Ensilage Book. S. N. CHASE.

FRANKLIN, PA., March 17, 1890.

THE E. W. Ross Co.

Gentlemen:—In the spring of 1888 I concluded to build a silo. Never having been inside of one and only once on the outside, I had to depend principally on my own judgment, and what information I got from your book on Ensilage and Silos, and Hoard's Dairyman. My building is 23½x37½ feet inside; set on a good 6 feet stone foundation laid in cement. Commenced feeding eight weeks after silo was filled. It was taken out by beginning at one end of the pit and cutting it down as needed. It looked brown when it came out, but on close examination I found a green tinge in it and can hardly say whether it was a dark green or light brown. It was almost sweet, and every animal on the farm that could get it, ate it. The cows increased in flow of milk as soon as they began eating it. I never used feed that seemed to please the cattle so well, or that kept them in as good condition. I do not think that in 1888 I lost 5 per cent. of the corn in the silo and in feeding it out. I am not able to tell what ensilage cost me per ton, but am satisfied that the cost although usually under-estimated, is less than that of any other feed equally as good, and that there is no other food as good for milch cows or to raise calves on. I raised 15 heifers last year and when spring came they looked fully as well as they did in the fall, if not better. My first year's experience with the silo was an undoubted success, and the No. 17 Cutter was all I needed and gave me entire satisfaction. I was so much pleased with my success in 1888, that I built another pit 16x27½x16 feet deep in 1889, and concluded to feed ensilage almost exclusively. I planted 20 acres of corn and as I had 10 acres of big clover, I concluded to put it into the silo. I cut the clover although it was a job. I also put in about eight acres of heavy oats cut when it was just about half-colored. Put both clover and oats

in without waiting for them to wilt, and some of the oats were wet with dew. I can harvest and cut oats into the silo cheaper than I could cut and thresh them, and by putting them into the silo I can be almost independent of the weather. They made excellent feed and I expect to put in more oats the same way. If this is done well and the pits covered with either grass or earth (dry straw is no good,) (I elevated the earth with my Ross Carrier) so that the heated air cannot escape or the cold air get in, there need be little if any loss in filling clover or oats into the silo. This year I shall plant 25 acres of corn for the silo, and should my oats prove to be heavy or the season unfavorable, I will also put them in. It is not expensive and I can soon build another pit if I need it. About farming and stock feeding, one thing is certain; if we cannot make it pay with the silo, we surely cannot do so without it. Our Cutter is just the thing, but every man should have two sets of knives if he cuts clover, so as to keep one set sharp, as th grit in the clover and the hard stalks will take the edge off of any knife ever made. One set does nicely for cutting corn.

Yours truly,

S. P. McCALMONT.

FROM MARYLAND.

GAITHERSBURG, MD., Feb. 10, 1890.

THE E. W Ross Co.

Dear Sirs:—My silos are above ground structures with 3x10 studding lined up inside with two thicknesses of yellow pine, with lining of tarred papers. The floors are simply packed clay, coming up on the inside to top of the sills. I have four pits 12x14, and 10x12, and they cost me complete, $250. I do not use any weights. Two of the silos were not covered at all, and two were covered with a little straw on which a few cords of stove wood was thrown. I usually open one of them about eight weeks after filling. My stock is in excellent, thriving condition. Dry fodder has no comparison with good silage. I am feeding 40 head of stock. Have used the silo for four years.

Yours truly, N. D. MUNRO.

GAITHERSBURG, MD., March 17, 1890.

THE E W. Ross Co.

Gentlemen:—In reply to your favor of the 6th inst. would say, I have been using ensilage two years and do not know how any farmer

can keep cows economically without it. My silo is built in the barn, all above ground. I used a part of my driveway. Size of silo, 8x13x14. I inserted some extra studding in barn frame and lined it on the inside with double white pine-boards one inch thick by twelve inches wide with building felt between boards. I laid the boards horizontally for the reason that the air is by that means prevented from entering the silo when filled, as it would do were the boards put on perpendicularly. It is a mistake to suppose that a building in which to preserve ensilage must be expensive. Mine cost about $25, and my ensilage is perfect even to the very boards. I filled it in three days with the assistance of five men and four horses; two horses at the power, the other two at the wagons, cutting up one load while the team drew another. Three acres produced enough corn to fill the silo which holds, according to the estimated weight per cubic foot, about 40 tons. The corn was planted three feet one way, and from 10 to 12 inches in drills. I think had it been husked it would have yielded fifteen barrels per acre. No one should plant corn for ensilage too thick to produce a heavy growth of ears, as well as fodder; for it is safe to presume that a stalk which has one or two heavy ears of corn on it has more nutriment than the same weight of thin, spindling fodder, without ears. I prefer to cut my ensilage when the grain has just left its milk state. I feed bran with silage, and a little dry corn fodder at noon. I put the cost of my silo at $1.00 per ton. If I had to return to the old ways of keeping cattle, I would quit the business. In building a silo, care must be taken to keep the rats from burrowing up through the bottom.

Respectfully yours,

C. E. MEAN.

FROM THE OLD DOMAIN.

MARLINGTON, W. VA., March 11, 1890.

THE E. W. ROSS CO., Springfield, Ohio.

Gentlemen:—In reply to yours of Feb. 22nd. I will say that I built a silo last season 10x20x18½ feet high inside measurement. I built my silo inside of a log crib, double-ceiled with inch boards, putting water-proof building paper between. My silo was cheaply constructed, but very strong. The cost of my silage was about $1.00 per ton. The corn when cut was beginning to glaze. Covered with second growth orchard grass. I would say, from the experience I have had with si-

lage, that every farmer who winters stock, and more especially calves, should have a silo.

Your Ross Cutter No 13 A. has proven entirely satisfactory.

Yours respec fully,

LEVI GAY

MR. GRAY'S VIEWS.

RICHMOND, VA., March 19, 1890.

THE E. W. Ross Co.

Gentlemen:—I first built a "dug out" silo in a clay bank some ten years ago, and filled with cut fodder, covering it with a layer of clay. I then built a stone silo 12x12x32 feet, costing $400, but the silage in it did not keep as well as that in the clay bank. With later experience I think a silo should be built for $1.00 per ton capacity. I find that corn to make best ensilage should be in the roasting stage when cut. I prefer to shook my corn and let it stand a week and harden the sap before cutting it into the silo. I think it makes sweeter silage. Corn should be grown and all expenses added, and put into the silo at a total cost of $2 00 per ton for the silage. Beef cattle and milch cows changed from silage to best dry corn fodder, and no change in grain, will at once commence to fall off in flesh and milk. Have had cows so fed shrink 25 per cent. in milk and butter. Yours truly,

F. GRAY

VIRCINIA AGRICULTURAL AND MECHANICAL COLLEGE—EXPERIMENT STATION.

BLACKSBURG, VA., Feb 28, 1890.

THE E. W. Ross Co., Springfield, Ohio.

Gentlemen:—Yours of recent date came duly to hand. In reply I state the following facts which may be of interest to you: Method of construction: Our silo is built upon a strong clay soil, which is dug out to the depth of 2 feet; with solid bottom of concrete plaster; brick walls 12 inches in thickness were run up 12 inches above the ground; upon this were laid in cement stringers of white oak 12x12; in these stringers were uprights of 19 feet, 4x4, placed 20 inches apart; an ordinary roof being placed upon this. The walls of the silo were of

double plank and saw-dust rammed compactly between. It has answered our purposes admirably so far.

How filled: The silo was filled by cutting the stalks to half inch lengths with the Ross Cutter, using the Elevator or Carrier to dump the matter thus cut into the respectacle. We cut daily until we had filled the silo to a depth of 3½ feet, when operations were suspended until the temperature would rise to about 132 degrees, when operations would be resumed. The substances used in filling were cut the day preceding and allowed to lie in the field and wilt slightly before being hauled up and deposited in the silo.

Amount and kind of weights used for pressing: We placed upon the upper surface of the silage, a piece of parchment paper covering it completely; upon this, ordinary inch boards nicely adjusted, so as not to open or hang upon the walls, and so placed as to break joints. Upon this we put a weight of stone of about 30 lbs. to the square foot. Cost of silage, $1.50 per ton.

Condition of stock: Experience has shown us that there is a great advantage in using silage as an adjunct to dry food with store cattle and milk cows, and that for young and growing cattle when fed alone as a long feed, with a proper addendum of corn, there is no equal to it. For ewes and store sheep during winter and spring there is nothing, in my opinion, so good.

Comparison between dry fodder and cut silage: To answer this question would require a considerable amount of work which I am sorry to say, I am not able to do at present. I would state, however, that the analysis of the silage made here upon the plants which we used, has shown that we get a larger per cent. of dry matter, than is shown by any analysis upon which I can lay my hands. The nutritive ration, however, is wider, and seems to require a considerable addition of nitrogenous matter.

Very cordially,

W B. PRESTON,

Director.

Spottsylvania County, Va., March 25, 1890.

The E. W. Ross Co., Springfield, Ohio.

Gentlemen:—In reply to your letter would say, our silos are three in number, 30x15x21 feet deep, side by side, with door openings on to feeding floor. We built on hillside, and the first 9 feet are concrete 16 inches thick, above that, framing with dead air space, two thicknesses

1-inch boards with tar-paper between. The silos occupy one fourth of the space of a $5,000 barn, and we can give no separate estimate of their cost. We fill slowly and let it get very hot; pack well in corners and cover with two feet of green weeds, put on it layers and tramped. Use no other weights or cover, and do not lose an ounce weight, there being no trace of mould. We aim to have our fodder fully mature and put up 400 tons. We begin feeding at once and find no harm in it. We use Southern White Corn mostly, but mix in cow-peas and Sojo Beans, the latter making prime ensilage. We run a winter dairy of Red Polled Cattle, and are convinced that without ensilage we could not manage at all. We have been feeding ensilage five years, and each year like it better. It is as sweet as honey and the cows thrive on it amazingly, giving quite double the amount of milk. We use a Ross Cutter for corn, cutting ¼ inch, and desire no better machine. We have a 26-foot angle Carrier, with 32-foot extension, and can change into any one of the three pits in two minutes. Our Cutter is stationary in the barn, belted from a main shaft, and we run the Carrier also direct from the main shaft at a less rate of speed, one-half, than when geared on the machine itself. This, where practicable, is a great improvement. There is no going back on the Ross Cutter.

Yours truly,

PIERSON BROS

FROM WEST VIRGINIA.

MARTINSBURG, W. VA., March —, 1890.

THE E. W. Ross Co.

Gentlemen:—I built a silo in the summer of 1888, 21 feet square by 22 feet deep, dividing into three pits; one pit 10½x21 feet, the other two 10½ feet square each; the small pits being for spring feeding when it is not desirable to have too large an area of ensilage exposed to the warm weather. I built a stone-wall 8 feet high and on it placed a 14-foot frame, double-boarded with paper between the boards, cemented the walls but will line up with boards next the walls the coming season, as the silage keeps much better against the boards than it does against the stone-wall. I think it is no exaggeration to state that I get more feeding value out of one acre in the silo than I did with two acres the old way, for corn can be cut and placed on wagons in the field as cheap as it can be cut and shocked (and corn once on wagons, the hardest work

about ensilage is over,) then corn can be hauled from the field and run through the Cutter and elevated by a Carrier to the pits as cheap as it can be shocked and fodder tied in the field; the ensilage having the advantage in cost over the cut and dried process of picking up the shocked corn in the field and loading on the wagon, unloading at the crib, loading and unloading the fodder, cutting the fodder and crushing the corn. The hauling is not taken into consideration, costing about as much by one process as the other. In conclusion I would urge upon every farmer to give the silo a trial, and they will find as the Queen of Sheba did of Solomon s glory, that "The half has not been told."

Yours truly,

C. A. WEVER.

CANADA.

[From high authority in Canada.]

Seminarre DeNicolet, Canada, March 15, 1890.

The E. W. Ross Co., Springfield, Ohio, U. S. A.

Gentlemen:—Your letter received and in reply will state that fifteen silos were built near here last season, and 30 more will be built this season. Our silos are built on a brick foundation, 22x9x12 feet with wooden frame, and cost $40. We put up 60 tons, when in the milky stage, and we estimate the whole cost at $2 00 per ton. I cover with hemlock boards and fill in the centre with six inches of sand. Our dairy consists of 14 cows. We mix the silage with cut straw, and the cows are in the very best condition and many are fit for the butcher's block. The silo in Canada is an acknowledged success, as its advantages are so obvious that only those who are willfully blind can continue in the old routine. Its greatest benefit is that with the silo any farm crop can be put in, and the resulting feed is eagerly devoured by the stock. Some are now filling with whole corn, but it is difficult to pack fodder that is 12 feet long, with butts 3 inches in diameter and guard against air spaces. We prefer to cut our silage, and use a Ross Cutter and horse-power. The best way to build a silo is to use part of the barn nearest to the feeding alley of the Cutter, and so feed direct into the stable. The silo saves all the time and trouble once demanded in drawing corn from the fields in mud, snow and rain, as the case might be. Our silo is 22x9x12. Silos should be made air tight at sides and bottom, as the air will kill the silage as quickly as air will kill a fish. I am sure

that the pit should not be over 12x14. We find it must all be taken off of the surface every day or it will get mouldy and will then lose much of its acidity and strength, and the cattle will not be as greedy for it.

Yours truly,

M. G. PREUX,
President of Nicolet College, P. Q.

FROM CANADA.

——— ——— ———, March 8, 1890.

The E. W. Ross Co.

Gentlemen:—We have three silos, one of stone and two of wood and put up yearly about 400 tons of silage, feeding 130 head of cattle The stone silo cost us $400, and the wooden ones about $150 each. We use your Cutter, and fill our silos fast or slow as we have opportunity, and occupied six weeks filling last season. We use no weights; cover with tarred paper, and on this put straw 2 feet deep. We endeavor to have the corn in the roasting stage when cut. We are sorry that we are unable to give you anything more than opinions based upon experience. All we can say is, that it is our opinion that ensilage is the cheapest food obtainable for cattle and fed conjointly with dry fodder is the best way to feed it. With ordinary care a good crop of corn is almost certain every year and the process of saving the silage is very simple. The percentage of waste in feeding silage is exceedingly small and it is smallest with our wooden silos.

Yours truly,

W C. EDWARDS.

WISCONSIN.

[From Wisconsin's noted dairyman.]

Fort Atkinson, Wis., May 5, 1890.

The E. W. Ross Co.

Gentlemen:—My occupation is that of a dairyman, and my object is to get as large a production of butter from my cows, and at the least possible cost that I can. For several years my yearly average of butter per cow has been over 350 lbs. Having become convinced that the silo was for me as well as for the other dairymen of Wisconsin, I built a silo last year. I built it of wood, 15x16x34 feet and put up 160 tons of ensi-

lage. I began to cut corn when the ears had begun to dent, and cut it into inch lengths when filling. I estimate the cost of my silage at $1.50 per ton. This silage is fed to 30 cows, and in comparison with any dry fodder which I have fed, the silage is the best.

C. P. GOODRICH.

A WISCONSIN MAN'S EXPERIMENTS.

WAUPON, WIS., February 1, 1890.

I have been experimenting with ensilage for the past three weeks, and will give my experience for the benefit of your readers.

Two kinds of corn were planted, the B. & W. ensilage and the Longfellow, a young flint. The flint corn was cut before there was any frost to speak of, and put into the silo, allowing time between fillings for the contents to heat up to 125 or 130 degrees. It was estimated that it would yield about 90 bushels of well-matured ears to the acre. The B. & W. corn was injured by the frost, so that the top leaves were quite dry. The silo filled with this corn was not allowed time to warm at all until the very last; there was some corn, not much though, and that not matured. When the trial began, had been feeding from the first silo several weeks. The milk was weighed for 20½ days; twelve days when feeding ensilage made from flint corn, and 8½ days on B. & W. ensilage. Grain rations the same in both periods with the addition of four pounds corn-meal per cow per day during the second period

First period, 12 days; 2,140 pounds of milk, from which 120½ lbs. butter was made; taking 17 lbs. 12½ ounces milk for one pound butter. Average yield of milk per day was 178 lbs. 5⅓ ounces. Average butter yield per day was 10 lbs. Second period, 8½ days; 1 552¼ pounds milk, from which 93½ pounds butter was made, taking 16 lbs. 9⅗ ounces milk for one pound butter. Average yield of milk per day was 182 lbs. 9⅗ ozs. Average butter yield per day was 11 pounds. Average yield of milk per day for the whole period was 180 lbs. Average yield of butter per day for the whole time was 10 lbs. 6$\frac{9}{10}$ ozs. Average number of pounds of milk for a pound of butter for the whole period was 17 lbs. 4 ozs. The yield of milk was 4 lbs. 4 ozs. greater per day during the second period, and the butter yield was also one pound greater. It took 1 lb. 3 ozs. less of milk for a pound of butter when fed on B. & W. ensilage.

W. M. TICHENOR.

REFUSES TO BE DISCOURAGED.

BURLINGTON, WIS., March 10, 1890.

THE E. W. Ross Co.

Gentlemen:—My silo is 18x32 and 24 feet deep and a success from the start. We were delayed the first season in getting our machinery, so that the corn was badly dried. Then we cut a few loads and broke down, causing a delay of two weeks. Before we got through we had heavy frosts, drying up the corn badly, so much so there were but few leaves left. It looked dry enough to put into the stack instead of the silo. I confess I was not very enthusiastic about that time. But into the silo it went, and was covered with short straw and chaff from the tail end of a threshing machine. In a short time the yard and surrounding buildings were filled with an aroma resembling a wine cellar, as one of my friends put it. He said it smelled good enough to tempt a prohibitionist. This season we filled mostly with large yellow dent with a good deal of corn on it, some in the milk, some glazed and some dented. Will use nothing else in the future.

This is not alone my experience, but that of several others in this vicinity. My silage comes out a nice dark brown with fine flavor, and stock of all kinds eat it in preference to anything else on the farm, and stomachs and teeth are all good. A young man, who has attended the short course at Madison the past two winters, said yesterday that he never saw anything better while in Madison, or since. So I say to new beginners, if your crop gets frosted this coming fall, don't be discouraged, for I would prefer to have it frosted, to having it too green.

F. BANKES.

MINNESOTA.

BENSON, MINN., April 11, 1890.

THE E. W. Ross Co., Springfield, Ohio.

Gentlemen:—We have been experimenting with ensilage for three years and are fully convinced of its value in this climate, whatever may be thought of it in States where winters are shorter and milder. We believe that it solves the problem of wintering stock cheaply. Cattle, hogs and sheep like it and thrive on it, and we have fed it to HORSES and COLTS for two winters with good results. Our silos are cheap above ground bins, for which portions of buildings already up were utilized. Very truly yours,

WILCOX & LIGGETT.

KENTUCKY

GAYLORDSVILLE, KY., Feb. 28, 1890.

THE E. W. ROSS CO.

Gentlemen:—I am but a small farmer, but will give you the history of my silo. I at first build a small silo in the corner of my barn and it pleased me so well, that I built another 10x16, and 21 feet deep and have filled it twice. I shall build another. I used Southern White Corn and cut it when in the milk stage. I did not use any weights and covered with green swale hay. For power, I used a two-horse Tread, and Ross Cutter. My cattle are looking fine and are in a thrifty condition. My silos cost me about $100. They are all of wood with cement bottoms. Judging from my own experience with ensilage, I should say a man can readily keep one cow a year to an acre by the aid of the silo.

Respectfully yours,

CHAS. E. CONKRITE.

FROM A NOTED STOCKMAN.

GUTHRIE, KY., March 10, 1890.

THE E. W Ross Co.

Dear Sirs:—In answer to your letter will say that my silo is built in one end of my bank barn. The bottom is 4 feet below the level of the cattle-stalls: the lower twelve feet in brick, laid in cement and plastered with cement. The upper twelve feet is made with two courses of ½ inch plank with tarred paper between the planks, put on up and down; 2x6 streamers, on outside, boxing plank put on without stripping My silo, built in my barn, 40x12x24 feet deep, with partition, cost $100. The silage was made from about 150 two horse loads. Cut it in with a No. 14 A. Ross Cutter. I formerly used weights but do not now as they are unnecessary. I open silo about two months after filling. The silage cost me about $3.00 per ton. I winter about 50 head of cattle (Jerseys.) Use cut hay with the silage. It is the best feed I ever used in winter. It keeps the cattle in as good condition as when fed on green pasture. I am very much pleased with the Ross Cutter.

Yours truly,

S. W. TALIAFERRO.

THE CHEAPEST FOOD.

SHELBYVILLE, KY., Feb. 22, 1890.

THE E. W. Ross Co.

Gentlemen:—Our silo is 16x24x9½, built of wood and stone, and cost us all told, $125. We put up about 8 acres, and cut the corn in the glazing stage We cut it in ½ inch lengths No weights were used. Covered with about six inches of cut straw. We find that an acre of our silage corn will, by this plan, winter two head of cows and is the cheapest food we have yet found.

Yours truly,

J. J. RAMSEY & BRO.

THE SILOS IN INDIANA.

St. Mary's Academy, NOTRE DAME, IND., March 6, 1890.

THE E. W Ross Co., Springfield, Ohio.

Esteemed Sirs:—We built a silo in the spring of 1889, the cost of which was $270.00. Size 20x30 and 20 feet high. Studding 2x6, Norway Pine, 16 inches from centers; on these, tar-paper, then drop siding for outside. On inside, 12 inch boards dressed and edged, then tar-paper again, again dressed boards, these painted with hot tar. We commenced to fill silo on the 17th of September with corn pretty well-glazed. When about one quarter full we had a slight frost which bleached the corn. We continued till Oct. 1st covered with two loads of straw and a little marsh hay. Began feeding Dec. 2nd found a little mould on top and some around the sides and some more at the corners. This continued until silo was half empty when no more mould was found. Number of stock fed was 47 milch cows. We are more than pleased with the silage. We will build another silo this year. We are also pleased with the Ross Cutter. Will make the next silo stronger. We used a portable engine for power.

Respectfully yours,

ST. MARY'S ACADEMY

BEST FOR HORSES.

BLOOMFIELD, IND., Feb. 27, 1890.

THE E. W. Ross Co.

Gentlemen:—My silo is built of studding set two feet apart, boarded up inside and cost about $100. The silos are 18 feet square. We fill-

ed with corn cut in half inch lengths and weighted with a cover consisting of one foot of chaff. The corn was in the roasting stage when cut. We opened the silo two months after filling. I place the cost of my silage at $2.50 per ton which is higher than is usually stated. My 30 head of stock do well upon it. I think a silo should be built round, like a railway water-tank. There are a few points in my experience which I wish to make emphatic.

First, that silage is the best feed for the general health of a HORSE ever fed. Second, that silage is a valuable food for a brood mare, and think it has proved with me, an excellent thing to feed a colt at weaning time Some of my silage was frost bitten and I found it sweeter than the other. Mr. J. W Heath, who puts up 3,500 tons, had 73 acres bitten with frost, but it all came out of the silo sweet and nice. Another thing, silage is better if the feeding is all from the top, and uniformily removed. I find a silo should be small and deep, and the deeper it is, the better the silage will keep.

Yours truly,

W. D. RITTER.

GREEN CASTLE, IND., May 10, 1890.

THE E. W. Ross Co., Springfield, Ohio.

Dear Sirs:—Under date of May 1st, 1888, we sent you a testimonial concerning your Cutters and spoke of making "dry ensilage," and since that time we have discovered that dry ensilage is a decided failure and think you would better cut that part of the testimonial out, or in fact all, should you issue another catalogue. We are now using "wet" ensilage, and it is as much of a success as the other was a failure.

Yours truly,

R. Z. and A. L. LOCKRIDGE.

MICHIGAN.

[Prof. A. J. Cook gives his views.]

WHY HE BELIEVES.

I believe the silo is the most important discovery to the farmer of modern times. It enables him to cure his entire crop in the most economical manner; it supplies a succulent crop in winter, which adds to the health of and increases the product from his farm animals; it sup-

plements, or supersedes the pasture in summer, and may make the expense of fencing much less. Corn is the crop par excellence for silage. It may also pay to put clover, especially the second cutting, into the silo. Corn and clover silage makes a well-balanced ration that both the stock and the chemist approve. If the second crop of clover cannot be well-cured it will certainly pay to put it into the silo. In case we have not enough corn for a supply during the entire season, then we should make silage of clover. In growing corn for silage, we should grow the variety and practice the method that will give first; the maximum of matured corn, and after that, the greatest yield of stalks. Ears of corn first, then a large amount of stalks. OUR CORN MUST BE OF A VARIETY THAT WILL MATURE in this latitude, a large yield of grain or corn. The silo should be frost-proof and air tight. At the north it should be double-walled, separated by ten inch studding or joist, to which the walls are nailed. The inner wall may be plaster or boards. Probably boards coated with some water tight preparation will prove cheapest and most durable. Many are troubled to make plaster stick. I would have the door run from just about the bottom to near the top. This door should consist of separate boards which may be placed in position as the silo is filled. I should have no partition but should feed from the entire top. If built as a separate building, there should be a good roof. The building should be strong enough to stand the pressure which is considerable. I expect to build another silo this summer. I propose to build it nearly round-octagonal, using joists 2x12 and board up and down, using only wood except for foundation. I do not cut the corn until it is glazed, and then cut and put it into the silo as rapidly as possible. I prefer to pass it through a Cutter, cutting it into inch or two inch pieces, though good silage may be secured by putting the stalks into the silo whole. I doubt if we need to tread the silage much as we put it into the silo. In one of our silos last year we *did not tread* it, and the silage was entirely sweet. I should always prefer to have the corn dry, when I put it into the silo, although this is not absolutely essential even to good silage. I would only put cut straw on top of the silage. This should be two feet thick. I should feed silage liberally to all my stock. WE FED OUR HORSES this past winter entirely on corn ensilage, except that we gave each a quart of oats twice a day. I never knew horses to winter better.

A. J. COOK,

April 20, 1890. Michigan Agricultural College.

OF STERLING QUALITY

MONROE, MICH., March 27, 1890.

THE E. W ROSS CO.

Gentlemen:—I built a silo 14x16 and 16 feet high inside, and 16x18 outside. Cost $164.33. It is above ground; bottom about one foot above the level; dirt bottom, stone foundation; sills 3x12; studding 2x12; boarded up inside, first with hemlock one inch thick dressed on one side, then covered with building paper, and then another course of 6 inch hemlock lumber dressed on one side; a 4x4 split from corner to corner, making a 6 inch surface, put in corners to help it settle there. Filled in between the studs with paper, and then sided with hemlock inch patent siding; rafters 2x8 and 1x6 spiked to top of studs and rafters on opposite side four feet from ridge. Shingled with No. 2 cedar shingles. Supposed to hold from 80 to 100 tons of corn if cut short and well-packed. Commenced filling the 12th of September and finished the 26th. Put in nine acres of corn as good as I ever raised. It was well-glazed, much of it ripe. Corn stalks, cobs and all went in. Cut and put on top of the corn 6 or 8 inches of second growth clover; on top of that 4 to 6 inches of artichoke tops, then covered with paper, and on top of that inch boards. On top of the boards cut and put about 6 inches of dry corn stalks, then about 4 inches wild hay. It is now nearly as high as top of studs. I painted the inside sheeting with hot coal-tar. I am confident that I put the corn into the silo at very little more expense than it would cost to cut up and shock the same. I have great faith in the silo, and have no doubt that all good farmers will adopt the system as soon as they investigate its advantages. I opened the silo Nov. 15th and found the fodder in good shape, and sweet, with a very little waste on top. Feed 27 milch cows and it will last until April. The cattle all like it, especially the calves. My cattle have wintered better than ever before, and the butter made is very choice. I shall build another silo the coming summer. I am now thoroughly convinced, by my experience, that a silo is the proper thing for a farmer to build. Yours truly, J. M. STERLING.

OHIO.

HUDSON, OHIO, Feb. 25, 1890.

THE E. W ROSS CO.

Gentlemen:—In reply to your letter would say that my silo is 16x32 feet, and 16 feet deep. Cement foundation, timber frame lathed and

plastered on the inside and cost about $400. I filled with corn which required about three days' labor this year, as I employed a force large enough to test your No. 14 A. Cutter to its full capacity. Covered the silage by putting on one foot of green clover. I did very little treading. I value my silage at $4 00 per ton. Corn should be glazed to make the best ensilage. My cattle are in fine condition. We feed two bushels of silage per day, and a little hay at noon. We feed 2 quarts of "mill feed" per day to our cows.

Yours truly,

W KRACHLE.

FIFTY PER CENT MORE FEED.

TACOMA, OHIO, Feb. 25, 1890.

THE E. W Ross Co.

Gentlemen:—In reply to your letter will say that my silo is of wood, only one thickness of weather boarding inside. I used hard pine flooring for siding and no paper The silo is in my barn bay and is 18x22x28 feet deep. Cost, including all work, lumber, &c $128.00. Filled with a Ross Cutter No. 14 A., cut ½ inch in length. Used no weights. Put about one foot of oats, straw and chaff on top. About two inches of ensilage on top moulded. Used Southern corn, cut when just past the roasting ear stage. I put in 200 tons and filled about Sept. 25th. It was opened Dec. 15th. 1889. It did not cost me quite 50 cents per ton to fill, including hiring Cutter, engine teams, and all labor. I am wintering 50 cows and 25 head of calves and yearlings fed wholly on ensilage for roughage, except a small feed of hay at noon. Stock did well. My cows with 8 quarts of wheat bran and one quart of linseed meal (new process) did as well as on good pastures in summer. Heretofore I have cut my dried corn fodder into ½ inch lengths. I am satisfied that by siloing the corn, I get 50 per cent. more feed than by the old way. I think cows should have a small ration of hay or straw or dried corn fodder each day. In making my 50 per cent. estimate in favor of the silo, I take into consideration the loss in handling dried corn fodder. With the best care I think there is 50 per cent. gain in favor of the silo.

Respectfully,

L. P. BAILEY.

THE MILK WAS FIRST-CLASS.

AURORA STATION, OHIO, April 25, 1890.

THE E. W Ross Co.

Gentlemen:—Regarding the character of milk made from cows almost exclusively fed upon good silage, I would say that for the past two winters, I have handled the milk of the ensilage fed dairy cows of John Gould of this place in connection with that of dairy cows fed by other methods, and find by comparison that the milk of his dairy is the equal in every respect of the best of the others. In creaming properties, the milk of his herd leaves nothing to be desired. I say this with confidence, having had nine years of creamery and factory practice, and management.

Yours truly,

H. L. COATS

JOHN FORBE TESTIFIES.

BEDFORD, OHIO, March 24, 1890.

THE E. W. Ross Co.

Dear Sirs:—I have two silos, both wood, and lathed and plastered. I planted field corn and the Southern White corn for silage, and mix then as I cut into silo. My silage costs me about $1.00 per ton; fifty cents to grow and the other fifty to cut and put into the pits. I feed 46 cows and they keep in fine condition. I find that ensilage makes more, and better milk than dry fodder, and the cattle like it better and eat it up clean. My milk is sold in Cleveland. All corn, if mature, makes good silage, but if it gets dry I would sprinkle on water as the fodder is cut into the pits.

A FISHERMAN'S LUCK.

NEWBURG, OHIO, March 17, 1890.

THE E. W. Ross Co.

Gentlemen: I built my silo in my barn, and it is a lathed and plastered one. I fill with ensilage and field corn alternate loads; field corn shooked a few days. It makes No. 1 silage. I filled one silo with 75 loads of clover July 1st, and it came out in the fall in the best possible condition and fed with great satisfaction. I think after feeding silage four winters that it is worth double the same feed dried. I use a Ross Cutter. I usually allow corn to wilt one day.

Yours truly,

LLOYD FISHER.

RATIONS.

While the average silo man feeds about 45 to 50 lbs. of silage each day to a full-grown animal, with from 5 to 10 lbs. mixed grain or shorts, with a small feed of hay at noon, and from it gets his best results, to be more "practical" we append a few formulated rations given by E. W. Stewart in the "Country Gentleman."

FOR A FULL FLOW OF MILK:—40 lbs. corn silage, 5 lbs. meadow hay, 3 lbs. corn-meal, 7 lbs. wheat bran, 2 lbs. cottonseed meal. The following formula will show its digestible nutriments in pounds:

	ALBUMINOIDS.	CARBOHYDRATES.	FAT.
40 lbs. ensilage	.48	4.80	.20
5 lbs. meadow hay	.21	2.20	.05
3 lbs. corn-meal	.25	1.89	.14
7 lbs. wheat bran	.81	3.22	.18
2 lbs. cottonseed meal	.71	.46	.12
	2.46	12.57	69

Ration, 1 to 5.4. This should produce a large yield of milk

FOR A MIXED ENSILAGE DIET, clover and corn silage, the following given:

	ALBUMINOIDS.	CARBOHYDRATES.	FAT.
30 lbs. clover ensilage	.69	3.00	.18
7 lbs. corn-meal	.59	4.41	.33
Total,.....	1.28	7.41	.51

Ration, 1 to 6.7.

The evening feed is as follows:

	ALBUMINOIDS.	CARBOHYDRATES.	FAT.
20 lbs. corn ensilage	.24	2.40	.10
4 lbs. shorts	.44	1.84	.11
1 lb. cottonseed meal	.35	.23	.06
	1 03	4.47	.27

Nutritive ratio, 1 to 5. When this day's feed is put together we have albuminoids, 2 31; carbohydrates, 11.88; fat, .78, and a nutritive ratio of 1 to 6. This should be a successful ration. When the cows go dry, feed clover ensilage and 6 to 8 lbs. shorts.

A RATION FOR A GOOD BUTTER COW.

	ALBUMINOIDS.	CARBOHYDRATES.	FAT.
45 lbs. ensilage	.54	5.40	.22
5 lbs. cut clover hay	.38	2 05	.07
3 lbs corn-meal	.25	1.89	.14
4 lbs ground oats	.36	1 84	16
6 lbs shorts	.66	2 70	.15
4 lbs. N. P linseed meal	1.13	1 11	.11
Total	3.32	14 19	85

Nutritive ratio, 1 to 5 1. There being in this ration so large a proportion of ensilage, which contains most of the qualities of corn-meal, very little corn-meal is required in addition, and it would do very well without any.

A VARIETY RATION.—Cows, in full milk, may have the following: 20 lbs ensilage, 12 lbs oat and lucern hay, 4 lbs corn-meal, 3 lbs ground oats, 4 lbs wheat bran, 4 lbs. pea-meal, 2 lbs oil-meal, and as this contains a large variety of foods we analyze it in pounds.

	ALBUMINOIDS.	CARBOHYDRATES.	FAT.
20 lbs. ensilage	24	2 40	.10
12 lbs. oat and lucern hay	60	5.25	.15
4 lbs. corn-meal	33	2.52	.19
3 lbs. ground oats.	.27	1 38	.12
4 lbs. wheat bran	.47	1.84	.10
4 lbs. pea-meal	.80	2 16	.12
2 lbs oil-meal	.58	.66	....
Total,	3 29	16 21	.78

This has a ratio of 1 to 5 5. A well-balanced milk ration for large cows and large yield of milk

FOR TWO GROWING CALVES.

15 lbs timothy hay	Dry	matter,	13.34
20 lbs ensilage	"	"	3.91
2 lbs oil-meal	"	"	1.78
1 lb oats	"	"	.87
1 lb. corn-meal	"	"	.90
4 lbs bran	"	"	3 50
Total,			24.30

Nutritive ratio, 1 to 6.6

FOR HORSES.—In addition to regular feed of grain give 12 lbs of silage per day to each horse, and feed correspondingly less hay.

THE E. W ROSS CO.

—MANUFACTURE—

TWENTY SIZES AND KINDS

—OF THE—

Celebrated Ross Cutters

—WITH—

IMPROVED CARRIERS,

Adapted to any Place or Angle.

HAND CUTTERS.

No. 02 Lever. No. 7 Geared. No. 8½ Geared.

"LITTLE GIANT" HEAVY HAND CUTTERS.

No. 9 A. Direct Action. No. 12 Direct Action.

"LITTLE GIANT" POWER CUTTERS.

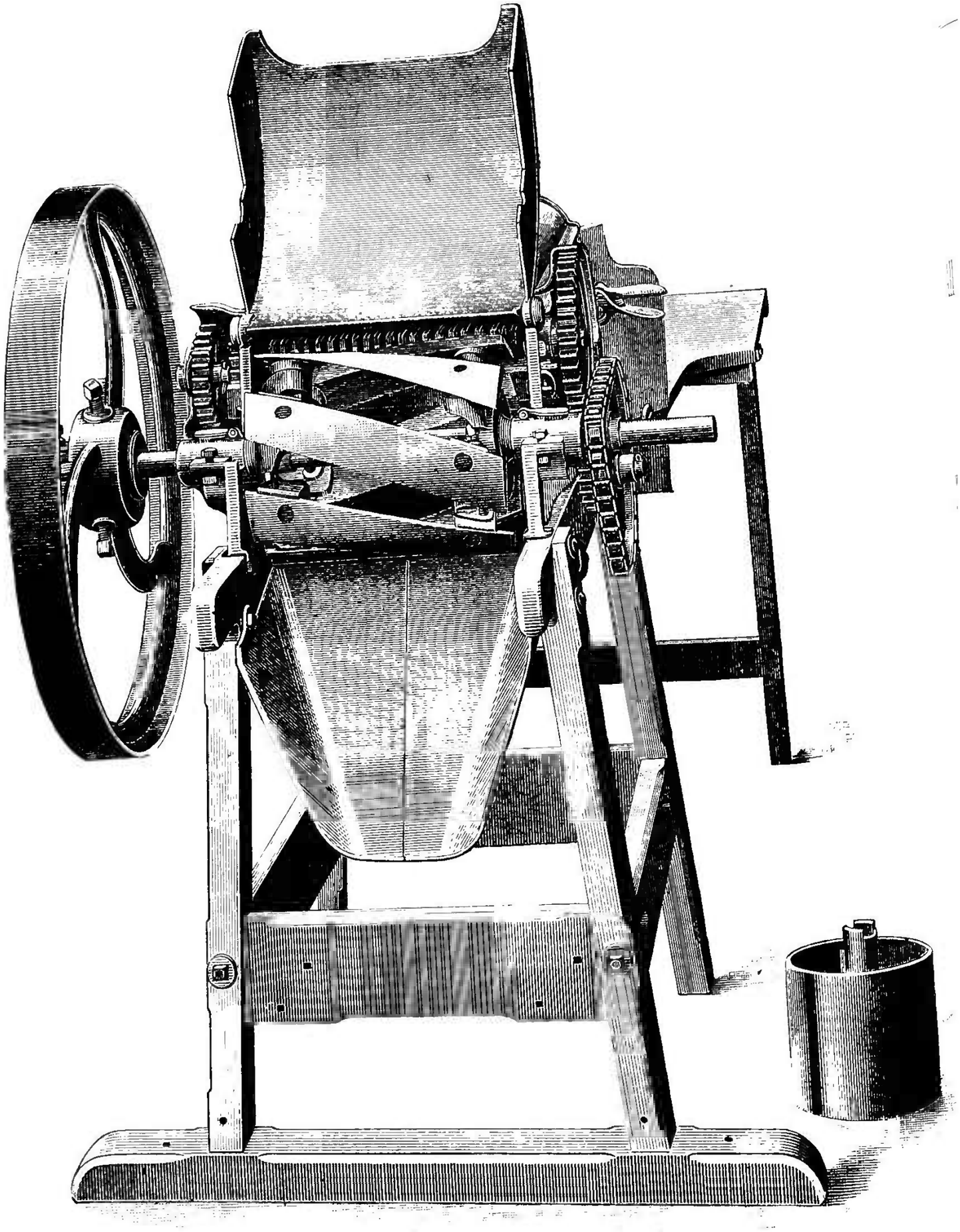
No 11 A.	Hand & Power.	No. 14 A	Power.
No 13 A.	"	No. 17	"
No. 111	" "	No. 116	"
No 113	"	No. 118	"

"NEW ROSS" POWER CUTTERS.

No. 212	No. 218
No. 214	No 220
No. 216	No. 224

"GIANT" CUTTERS.

No. 18 A ..... weight 2,000 lbs
No 26 A ..... " 2,600 lbs.



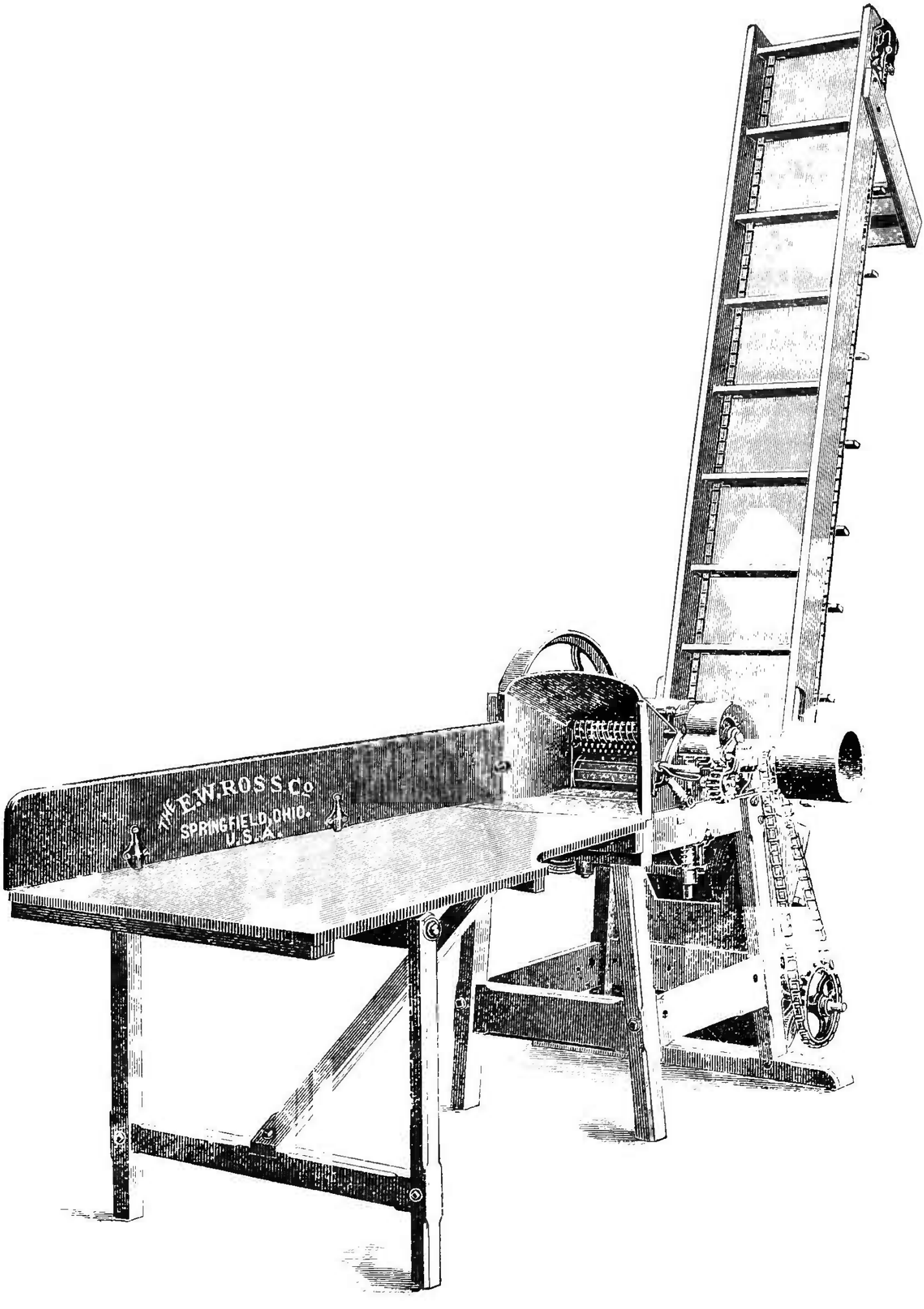
No. 214.—"New Ross" Cutter.

All Power Cutters have our patent Safety Fly Wheels.

In addition to the strong points of the regular Ross Cutters with which the trade is generally familiar, we have made numerous important changes and improvements for the season of 1890, prominent among which are the new "Little Giant" sizes, No 111 to No. 118, and the "New Ross" Cutters, No. 212 to 224.

The new Little Giant Cutters, Nos. 111 to 118, are provided with an improved arrangement of expansion gear, very simple yet absolutely reliable, which are set close to the side plates of the machine, permitting the main shaft to be shortened and fly-wheel and pulley to work in close to the main shaft boxes. Also a new stop lever which is convenient to reach from either side of the Cutter and instantaneously stops the motion of both of the feeding rolls Also a new style safety fly-wheel, which with the driving pulley are put on the main shaft with provisions for making them interchangeable, to work on either side of the machine. These Cutters will be furnished with either a new design feeding box or with the patent ensilage table as desired.

The "New Ross" Cutters have a largely increased capacity over any machines made, not excepting the Little Giant sizes of our own make. There have been so many valuable improvements made in this line of machines that it is impracticable to enumerate them here Descriptive catalogues will be furnished upon application.



No. 214 "New Ross" Cutter, with Pocket Carrier, delivering straight away from the Cutter.

CARRIERS.

Carriers in connection with Cutters have now become an accepted necessity, fully nine-tenths of all the large Cutters sold now being supplied with our improved Carriers. Their use will save the labor of from one to six men (depending upon the size of Cutter) and do the work quicker, cleaner and more satisfactorily, and at no expense after the first cost They deliver upon the same level or will elevate at an angle of 50 degrees, or our new pocket carrier will elevate up to an angle of 80 degrees. They are also used either by hand or power for carrying ensilage or dry fodder from silo or barn to such places as it may be necessary to feed There is no canvas or belt enters into their construction to soon soak up or fray out On the contrary, they are practically indestructible, being made of wood and iron.

We can furnish these Carriers as follows:

"Standard" Ross Carriers.

"Little Giant" Ross Carriers.

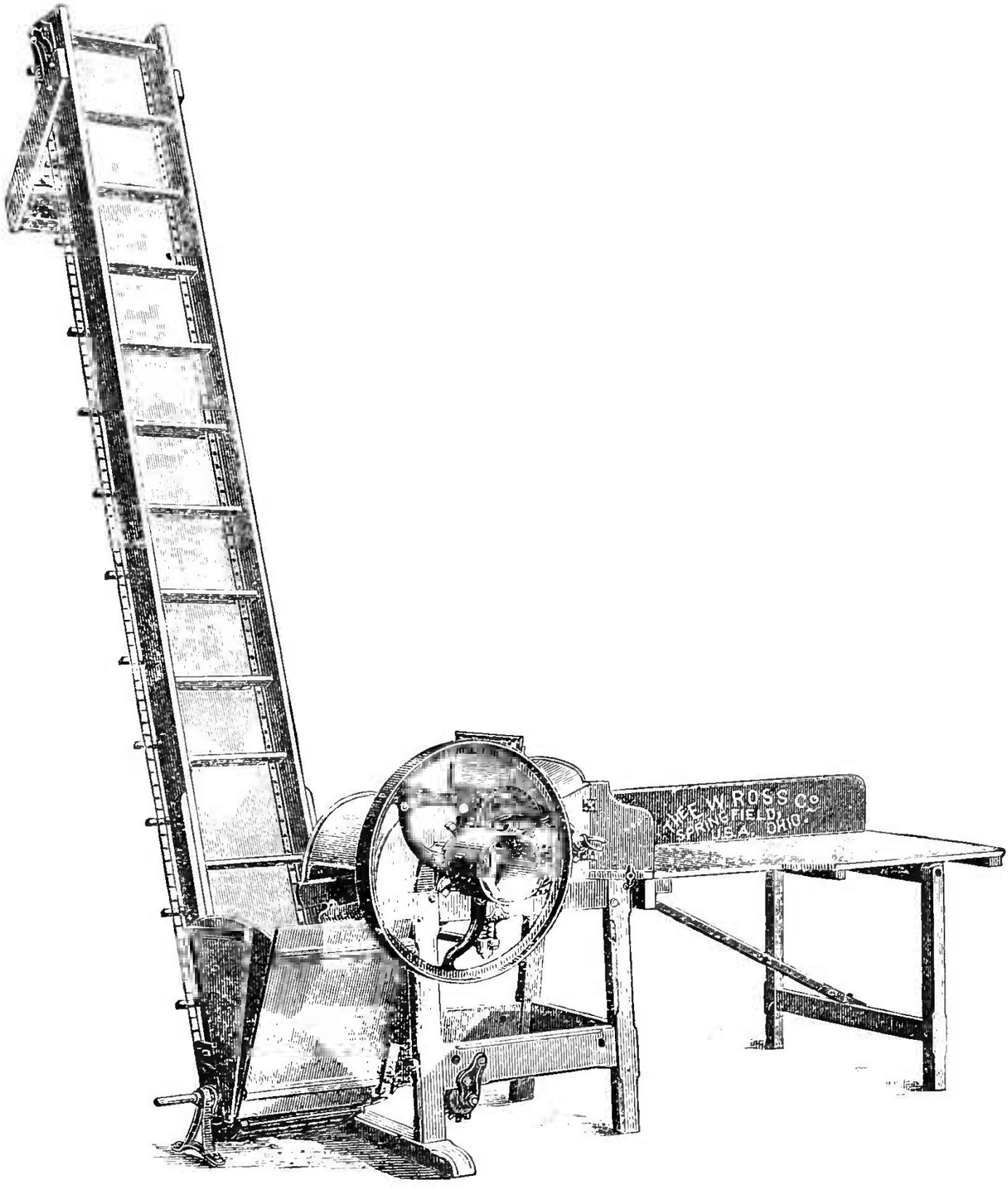
"New Ross" Pocket Carriers.

The "New Ross" Carriers, are be supplied with our patent pocket, adapting them to any angle of elevation up to 70 degrees

Also Carriers with metal strips riveted to buckets.

Any of the above Carriers can be furnished either both straight and angle delivery, straight away, or reversible, i. e to deliver to the right or left of Cutter. The particular advantages in using the angle delivery Carrier are: 1st The saving in floor space required. 2nd. Allowing the main drive belt to be run directly away from the Cutter, which leaves the feeding end of the machine entirely clear all around it for wagons, material or workmen, and permits the operator to feed the machine on either or both sides as best suited for receiving the material to be cut. 3rd. Permits the use of the Cutter close up to the silo or bin into which the fodder is to be elevated.

Where straight-away Carriers are used it is generally necessary to belt forward beside the Cutter, thereby shutting off completely with the belt, all of one side of the machine, preventing the approach on that side by the wagons, men or material, largely increasing the cost of filling the silo. Our New Ross" Pocket Carriers are furnished with our patented Pocket, permitting the Carrier being set at any angle up to 80 degrees, as straight-away, or at any angle up to 70 degrees



No. 214 "New Ross" Cutter, with Angle Pocket Carrier delivering to the Right.—Improved Carrier Hopper.

as an angle delivery Carrier. The pocket Carrier economizes largely in floor space required for Cutter and Carrier, also by reason of the sharp angle at which it can be set, permits a large saving in length of Carrier needed, and accomplishes the work without the use of a second or supplemental Carrier which appears to be necessary with all other makes of machines, when it is desired to elevate at sharp angles. The cuts on pages 128 and 130 and 132 show 1st, the pocket Carrier as straight-away set at about 80 degrees; 2nd, set as an as angle Carrier delivering to the right, set at about 70 degrees, and 3rd, set as an angle Carrier delivering to the left, set about 70 degrees. Please notice in the cuts, the neat arrangement of the Carrier hopper, which can be instantly changed to adapt it to any elevation of Carrier, and still maintain a close, tight, simple hopper.

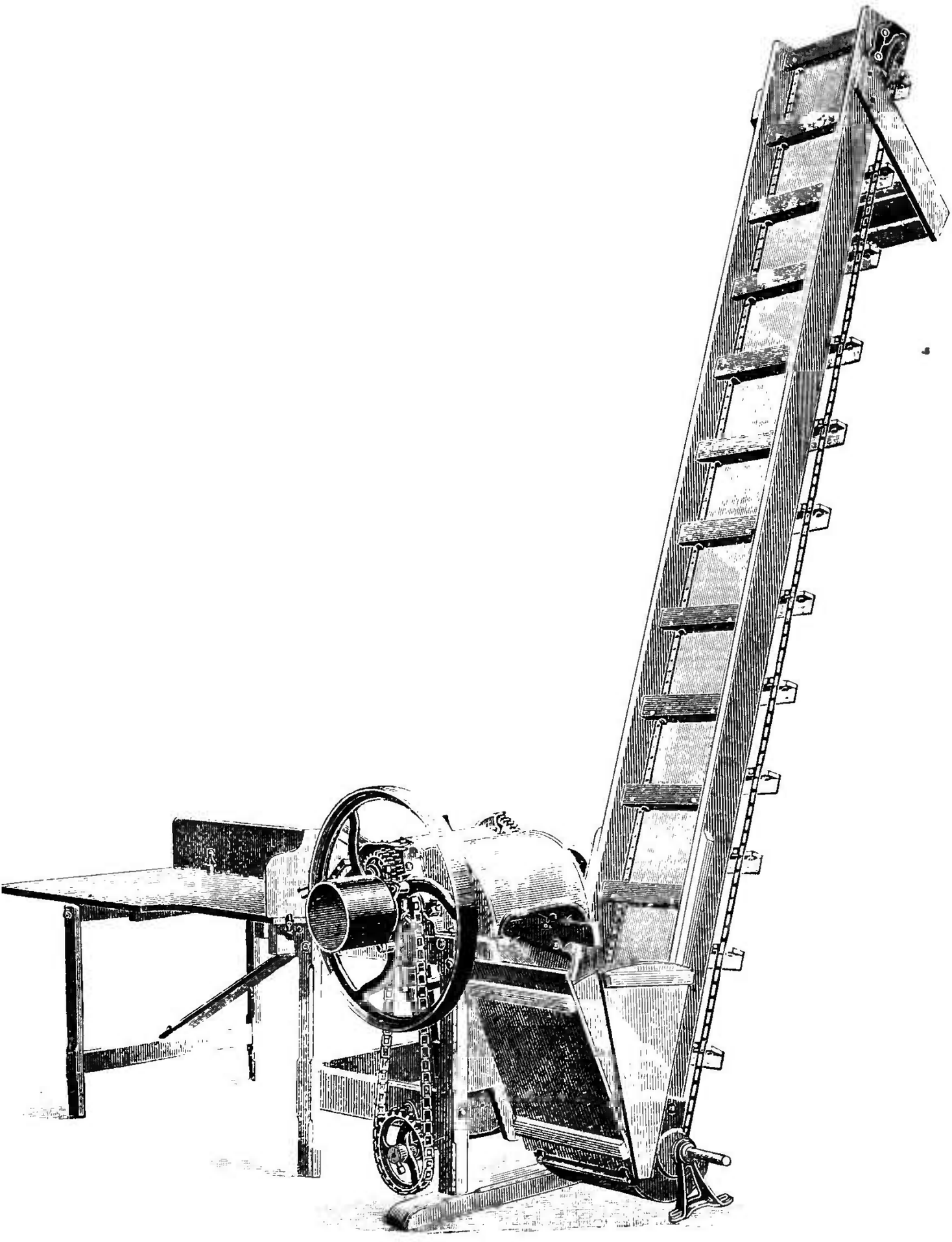
All working parts of our Carriers are exposed to view and can be readily oiled, inspected and adjusted, the entire weight of the Carrier and its load is supported by a special device of our own, relieving entirely from weight the shafts and boxes which can be run free without undue friction. The same device secures and holds in position on the bottom shafts and chain wheels, preventing the slipping or moving of said parts while the Carrier is being attached, elevated or detached. The chain used is of the best malleable iron, carefully tested, and can be quickly unjointed or jointed at any point wherever necessary.

Our Carriers require but little power to drive them, the parts being carefully made and fitted, the friction is reduced to a minimum, and in turning a large Cutter by hand, but little difference is noted in the power required to run it with Carrier attached, as compared with turning the Cutter alone.

Our patent devices for taking up the slack of the chains, after they are hooked together, is simple, yet very effectual, securing at all times an equal tension of both chains. This device overcomes the many difficulties experienced with all other Carriers made. The chain will not jump the sprocket teeth, cannot slip or stretch unevenly, but will run free and smooth under the heaviest labor. The wood-work is well-made and put together, the sides are high, suited to our Cutters, which on account of their increased capacity, need greater Carrier capacity than with other Cutters.

We recommend every buyer in ordering to select our Pocket Carrier, as the slight advance in cost over the cheaper Carrier will very shortly be saved in the many advantages enumerated.

The Ross Carriers are covered by patents and can only be had of ourselves or our agents.



No. 214 "New Ross" Cutter, with Angle Pocket Carrier delivering to the Left.—Improved Carrier Hopper.

POWERS.

We are now prepared to furnish the following Horse-Powers:

ROSS SWEEP POWERS.

2-Horse Triple Geared, with 2 Levers and Stay Rods.
4 " " " " 2 " " " "
6 " " " " 3 " " " "

RAILWAY, OR TREAD POWERS.

1-Horse Single Geared, with Improved Brake.
1 " Double " " " "
2 " Single " " " "
2 " Double " " " "

Patent Governors furnished where desired.
Trucks for 1 or 2-Horse Powers.

These powers are made by ourselves and are sold as superior to anything in the line now on the market. We have expended large sums of money in experimenting with powers and confidently assert that we can now furnish the best built, most durable and most desirable powers, with the least possible friction.

OUR WARRANTY

Our machines are warranted to be well-made, of good material, and to do good work, if properly set up, adjusted and operated. We guarantee our Cutters to run lighter, cut easier, and do more work with less power than any other Cutters in the world. Great care is used in inspection with the view of permitting no defective piece to enter into the construction of the machine, but should any part break from flaw or defect, we are prepared to furnish a new piece, to replace the breakage without charge. If on starting a machine, it should prove defective, or not perform its work, immediate notice should be given to The E. W Ross Co., Springfield, Ohio, and sufficient time allowed to make the machine work, or replace it with another machine. Keeping the machine, whether in use or not, shall be deemed conclusive evidence that it fills the warranty.

We challenge the world to competitive trial as to the merit of our Cutter. We say they are the best in the world, and if necessary, we will furnish any responsible person a machine to be used in a test trial with any other machine of the same size with the understanding that the customer is to purchase the machine doing the most work with the least power and in the most satisfactory manner.

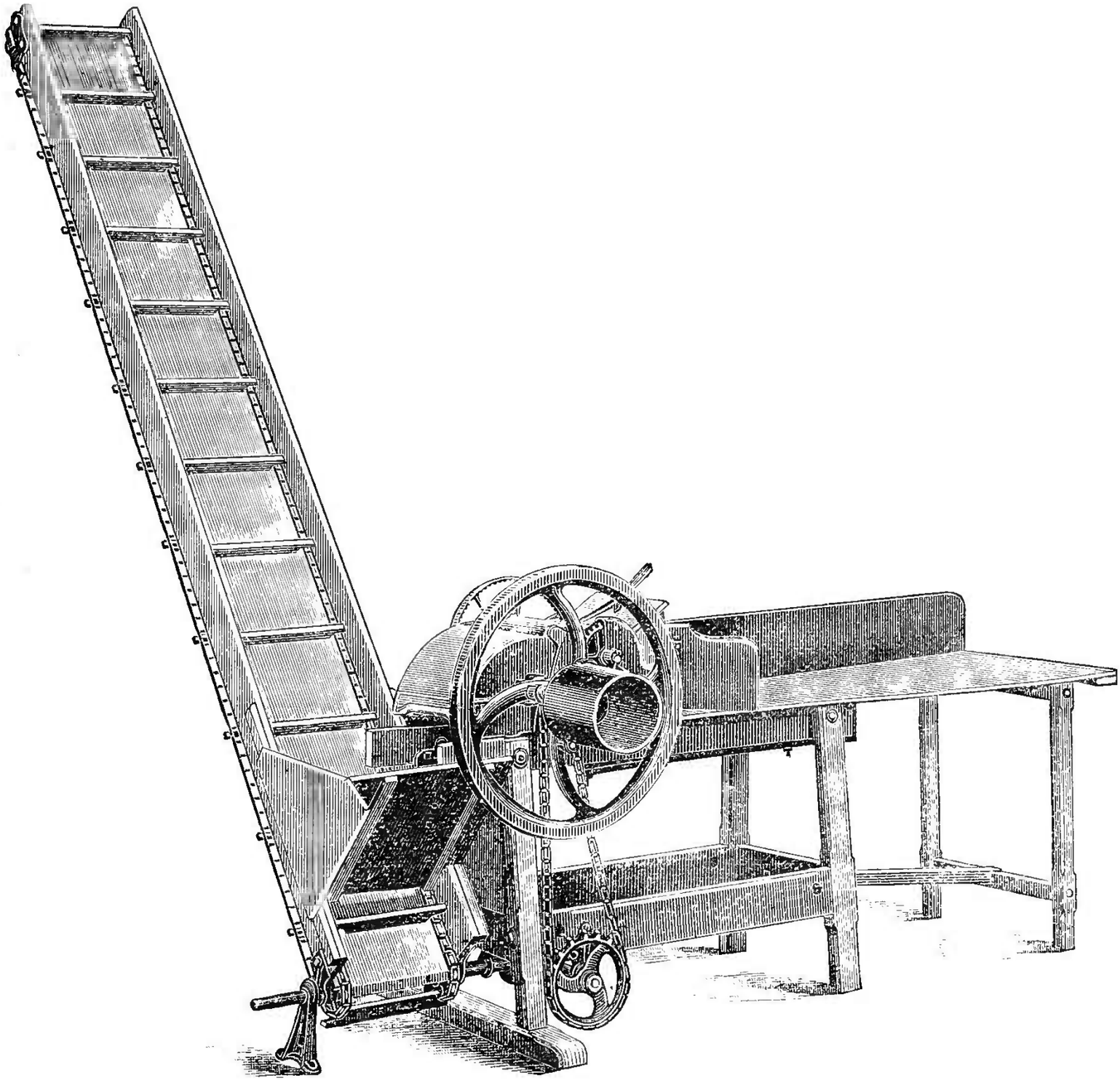
THE E. W. ROSS CO.

Directions for Ordering Carriers.

Please submit to us a rough sketch showing the position of the silos to be filled, giving the height of wall, or partition above the feet of the Cutter also thickness of the wall over which the Carrier is to deliver. State whether the Carrier is to be an Angle Delivery, either to the right or left, as shown on pages 130 and 132, and we will figure the length required. Also advise us the kind of power to be used, showing the position of power, and the amount of space around the silo where the Cutter can be placed, and the direction from which the material to be cut must come to the Cutter. Our experience of such matters, extending over a period of many years, frequently enables us to make valuable suggestions to our customers, both in the selection of machinery and in the placing of same.

Where two or more silos stand in a line, we can furnish Horizontal Extension Carriers to be driven from the upper end of the elevating Carrier, supplied with trap-doors for dropping the cut fodder in the center of all the silos separately at will, information having been given as to the inside measurement of each silo and the thickness of partition wall.

NOTE.—A few years since we furnished for Mr. Pierre Lorillard's Rancocas, N. J., farm, a Horizontal Extension Carrier, 278½ feet long, for delivering the fodder into 23 silos standing side by side in a straight line. We believe this is the longest Carrier of the kind in the world.



No. 113 "Little Giant" Cutter with "Little Giant" Angle Carrier delivering to the Right.

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