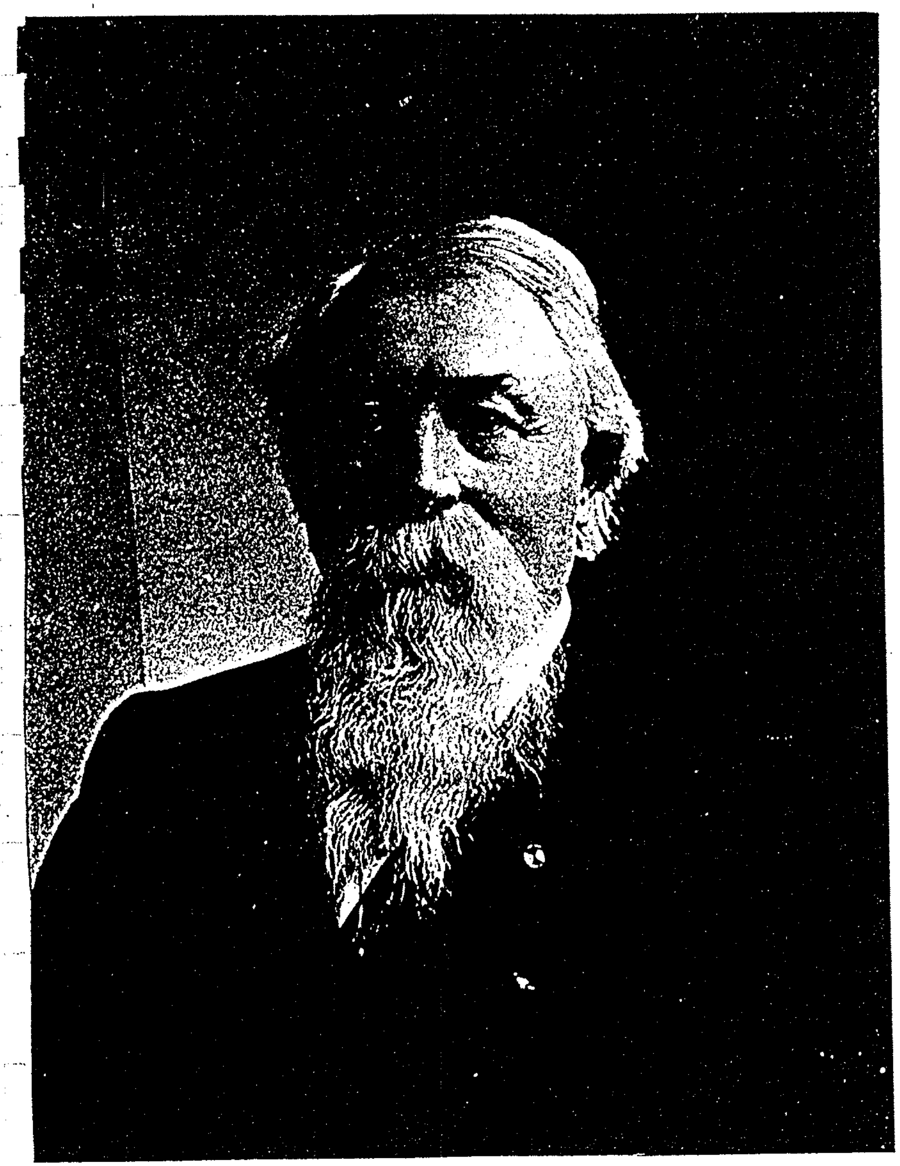

JEREMIAH M. RUSK.
(Secretary of Agriculture, 1889-1893.)

YEARBOOK

OF THE

UNITED STATES

DEPARTMENT OF AGRICULTURE.

1898.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1899.

[PUBLIC—No. 23.]

AN ACT providing for the public printing and binding and distribution of public documents.

* * * * * * *

Section 73, paragraph 2:

The Annual Report of the Secretary of Agriculture shall hereafter be submitted and printed in two parts, as follows: Part one, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; part two, which shall contain such reports from the different bureaus and divisions, and such papers prepared by their special agents, accompanied by suitable illustrations, as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the Department for their information. There shall be printed of part one, one thousand copies for the Senate, two thousand copies for the House, and three thousand copies for the Department of Agriculture; and of part two, one hundred and ten thousand copies for the use of the Senate, three hundred and sixty thousand copies for the use of the House of Representatives, and thirty thousand copies for the use of the Department of Agriculture, the illustrations for the same to be executed under the supervision of the Public Printer, in accordance with directions of the Joint Committee on Printing, said illustrations to be subject to the approval of the Secretary of Agriculture; and the title of each of the said parts shall be such as to show that such part is complete in itself.

PREFACE.

The present Yearbook does not in form differ materially from its predecessors, with the exception of the Yearbook for 1897, to which, as explained in the preface to that publication, a special feature had been added by direction of the Secretary of Agriculture, consisting of articles from each chief of Bureau, Division, and Office outside of those that are purely administrative, presenting "in plain terms the relation of the work of his Bureau, Division, or Office to the farmer." This addition made the Yearbook of 1897 consist of four distinct parts instead of three, as usual. While the form has been changed, the spirit of this special feature has by no means been neglected in the present volume. No attempt was made to secure an article for this book from every chief relating to the general work of his Division to the farmer, as was done last year—a course which would have inevitably resulted in more or less repetition; but the chiefs understood that it was the wish of the Secretary that the practical service rendered to the farmer by the Bureau, Division, or Office contributing the article should be made apparent. A perusal of the articles composing the present volume will show that in this respect the Secretary's injunction has not been overlooked. It has not, however, been found necessary to segregate such papers; hence, the present Yearbook conforms to the plan originally adopted, and consists of three parts: (1) The report of the Secretary of Agriculture to the President for 1898, thus complying with the law, which prescribes that the volume shall "include a general report of the operations of the Department;" (2) miscellaneous papers, prepared with very few exceptions by the chiefs of Bureaus, Divisions, and Offices of the Department or their assistants; and, (3) a summary of useful information, published in the form of an appendix.

To the third feature of the present volume special attention has been given with a view to increasing its scope and usefulness. While preserving the main features of former years, an effort has been made to give the Appendix of the present Yearbook the character of an agricultural directory. Thus, in addition to the usual Department directory and the directory of colleges and experiment stations, there have been included lists of the principal officials having charge of agriculture in the several States; of managers of farmers' institutes; of national and State dairy officials; of the several associations of cattle

horse, and sheep breeders, with their secretaries; of the State veterina-
rians and State health officers; of the forestry officers of the different
States and of the forestry associations; of the officers of the horticul-
tural and kindred societies, etc. In this connection the Editor may be
permitted to call attention to the great difficulty of securing such
information, and to suggest that its publication in an edition of 500,000
copies for distribution to the farmers of the country should make it
worth while for the several officials interested, to themselves supply
the Department with the necessary data for the presentation of this
information in the Yearbook. If possible these data should be in the
hands of the Editor by January 31 of each year.

In addition also to the usual statistical matter, including the crop
statistics and prices of farm products and the imports and exports
of agricultural products and transportation rates, and in view of the
natural eagerness of the people for information regarding the new
dependencies, figures are given showing the foreign trade of Cuba
and of the Philippine Islands. Similar figures are not given for
Puerto Rico and Hawaii owing to the fact that in the main body of
the book are to be found special articles upon these islands.

Attention is also called to the review of the weather for the past
year, prepared by an expert of the Weather Bureau, and which pre-
sents a detailed weather record in comparatively simple form. This
review is continued from year to year, and promises to grow constantly
in interest and usefulness.

GEO. WM. HILL,
Editor.

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YEARBOOK

OF THE

U. S. DEPARTMENT OF AGRICULTURE.

REPORT OF THE SECRETARY.

To the President:

I have the honor to submit a report of the work of the Department of Agriculture for the year ending June 30, 1898. This report contains a review of the operations of the several Bureaus, Divisions, and Offices through which the work is carried on. For your own convenience and that of those who shall have occasion to peruse this report, I have preceded this general review with a summary, in which some salient feature of the work undertaken by each of these several Bureaus, Divisions, and Offices is very briefly indicated. Several considerations are also presented of a more general character relating to the work of the Department and the services which I conceive it should seek to render to the country, upon which some earnest recommendations are based, and which have also been made the basis for some of the estimates submitted by me for the appropriations for the Department for the ensuing fiscal year, and to which the favorable consideration of Congress is earnestly invited.

SUMMARY.

WEATHER BUREAU.

Observation and forecast stations have been extended around the Caribbean Sea, to warn our fleets and merchant vessels of danger from cyclones, and increased through the interior of the country, especially in the mountain States, to enable the observer to inform fruit growers of precipitation and sudden changes of temperature.

DIVISION OF VEGETABLE PHYSIOLOGY AND PATHOLOGY.

Good work has been done by the Division of Vegetable Physiology and Pathology in hybridizing the orange and other citrus plants, and in the crossing of pineapples, whereby the size and vigor of the fruit are much increased and the flavor greatly improved.

SECTION OF FOREIGN MARKETS.

Our knowledge of the islands of the Caribbean and China seas is increased by timely publications of the Section of Foreign Markets.

for sandy soils. After the land has been leveled and covered with a turf it will require little further attention except an occasional mowing. The children, by their tramping, will keep down some of the weeds, and they may be encouraged to destroy others that appear. It is not expected that a fine, even turf will be maintained equal to that in the parks, nor is this essential for the purpose in view. The grass will remain green during most of the year, and when the leaves do turn yellow and decay there will not be enough of them to pollute the air or induce disease.

In the outskirts of cities or in villages where there is plenty of open space for the children, vacant lots may well be used by the needy or by people out of employment for the cultivation of vegetables, according to the plan tried in Detroit, Buffalo, Columbus, Brooklyn, and Chicago, which has generally proved very successful for the purpose intended. Besides supplying the immediate wants of the deserving poor and providing healthful exercise, this work tends to give a wholesome taste for agricultural life. To obtain the highest benefit from vacant lots used for this purpose, and to prevent them from being overrun with autumn weeds, they should be cleared up and seeded either to crimson clover (where this will grow) early in the fall or later to rye. These plants will cover the naked ground and keep down weeds. Crimson clover will increase the fertility of the soil, and in the spring its bright flowers will repay many times the slight expense of growing it.

Where there are large areas of partly improved parks or subdivisions not yet placed upon the market, the vegetation may be kept down at slight expense by pasturing sheep on them. This method is pursued in Druid Hill Park, Baltimore, and in Central Park, New York, and it is found that the sheep make very effective and very economical lawn mowers.

The work of destroying the weeds and improving vacant lots can doubtless be done best by municipal direction under the immediate supervision of the park or street departments. In the larger cities it may be difficult to obtain the necessary municipal legislation. City authorities may wait to feel the pressure of public sentiment, and public sentiment may need to be educated to a just appreciation of the benefits to be gained. A few good examples, which may be produced through individual effort or by the united action of a small community, will demonstrate the practical utility of the work and lead to its extension. Examples of this kind are now found in many villages and suburban towns. If the practice can be made general in the cities and towns throughout the country it will cut off one of the principal avenues for the introduction of foreign weeds.

THE USE OF KITES IN THE EXPLORATION OF THE UPPER AIR.

By C. F. Marvin,
Professor of Meteorology, Weather Bureau.

HISTORICAL NOTES.

Ever since man began to observe and measure the conditions of the atmosphere around him a good deal of effort has been expended to find out what sort of conditions prevail high up in the free air. From what is known at present it seems that kites, which are so old that history does not tell us certainly of their origin, were the first things employed to gain this information. Nearly one hundred and fifty years ago Dr. Alexander Wilson, an astronomer in Edinburgh, Scotland, attached thermometers to kites which he flew to great heights, and thus ascertained the temperature in the clouds. Two years after this, but without any knowledge of Dr. Wilson's work, our own Franklin drew the lightning from the thunder clouds by means of a kite, and demonstrated its likeness to the electrical sparks produced by the laboratory machines. Balloons were unknown at this time, and over fifty years elapsed before scientists began to use them for conducting researches in the upper air.

In 1895 Prof. Willis L. Moore, the present Chief of the Weather Bureau, decided to undertake, by means of kites, the most complete survey of the free upper air ever before attempted. The plan adopted was to equip a number of stations distributed over the United States with kites and to make daily ascensions, sending up automatic instruments to a nearly uniform height of a mile if possible, the object being to secure a record of the meteorological conditions in the free air. Prior experiments made at the Weather Bureau and by others elsewhere had demonstrated the possibility of using kites for such a purpose, but very much remained to be done to bring the whole kite apparatus to that state of efficiency required in securing a successful execution of so difficult an undertaking.

While the Weather Bureau has been conducting this work, which comprises almost daily observations in a free horizontal air stratum about a mile high, independent kite ascensions have been made by several private individuals, the most important of which in the United States are the ascensions made at the Blue Hill Observatory, near Boston, under the direction of Mr. A. L. Rotch.

The results from a single station of this sort serve to show only the change in atmospheric conditions as the kites pass up or down through successive strata; or, if the kites are kept continuously at a fixed elevation, the observations show the change in conditions from hour to hour.

In Europe small balloons, equipped with automatic instruments, have been cast free, from time to time, and have ascended to very great heights before losing their bouyancy, when, slowly falling to the ground, they have thus brought back records of the conditions at extreme heights in the atmosphere which were never reached before. Lately European meteorologists have employed both kites and balloons for atmospheric explorations, so that we may fairly say that kites are now no longer toys only, but are highly valuable pieces of scientific apparatus as well, the use of which will no doubt be greatly extended in the near future.

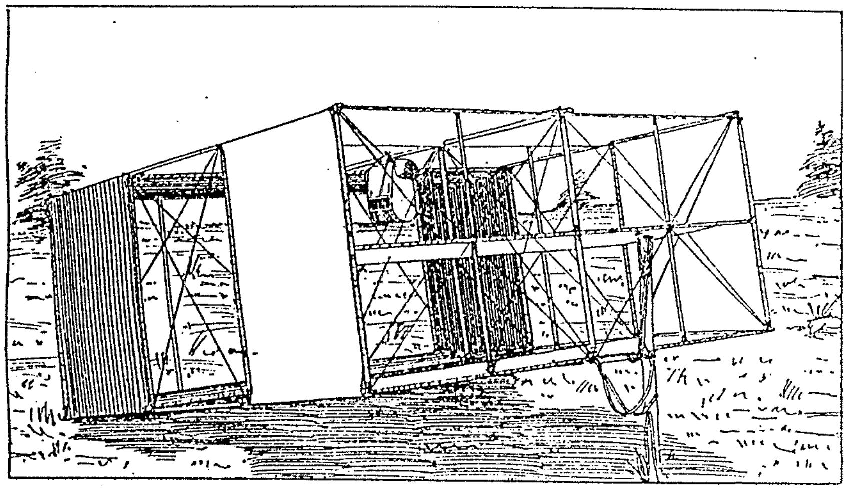

FIG. 50.—Standard Weather Bureau kite.

STANDARD WEATHER BUREAU KITE AND APPARATUS.

THE KITE.

The modern scientific kite is a far more efficient structure than any of the well-known toys, but its construction is correspondingly complicated, and, in most cases, somewhat more than the average mechanical skill and facilities are required to build one. Fig. 50 is taken from a photograph of one of those used by the Weather Bureau in its aerial work. The oval object seen suspended between the cells is the automatic instrument which produces the desired record. This kite contains nearly 70 square feet of supporting surface, and, in a strong wind, will exert a pull amounting to from 60 to 100 pounds and over. Of course, such a kite can not be flown and managed directly from the hand. The line is carried upon substantial reeling apparatus, which, in turn, is securely anchored to the ground.

DESCRIPTION OF REELS.

One of the hand reels employed at kite stations is shown in fig. 51. The large iron drum contains between 2 and 3 miles of fine steel music wire, joined in one continuous length. The greater part of this is often carried out by the kite in making a high ascension.

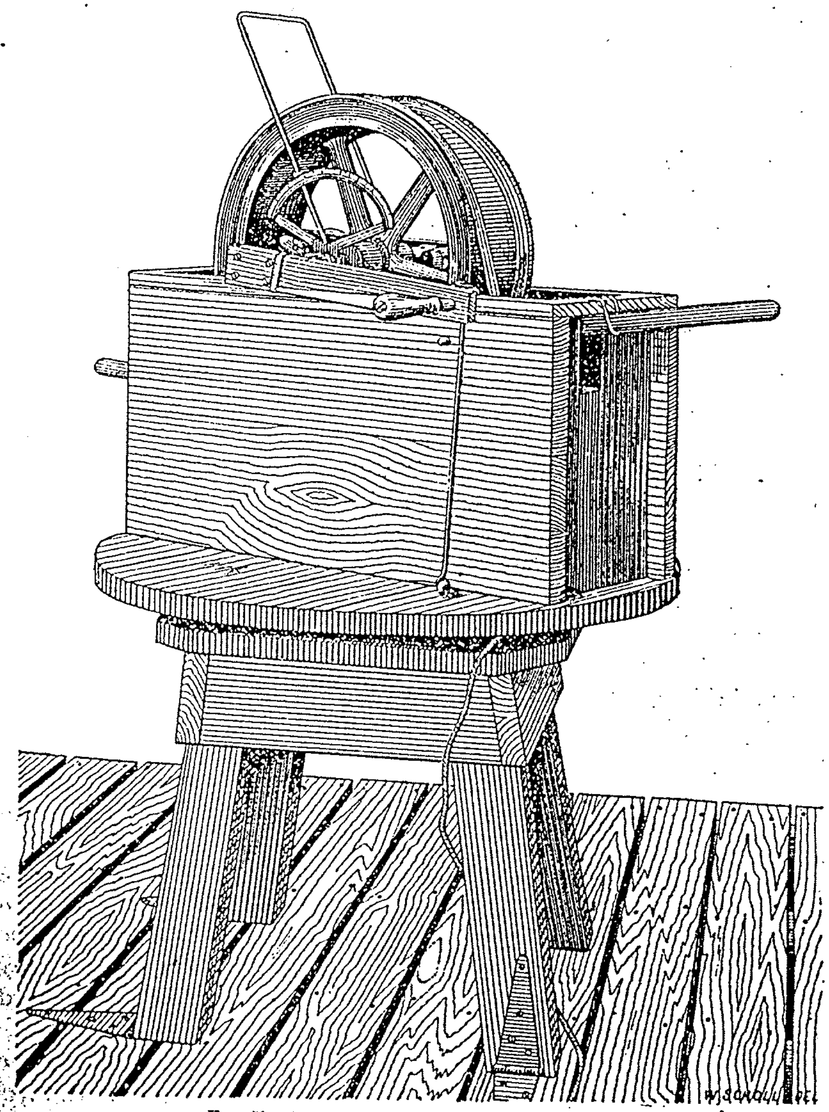

FIG. 51.—Standard Weather Bureau hand reel.

This wire is the lightest, and, relatively, the finest and strongest material known. The size employed in the Weather Bureau work is about the thickness of an ordinary pin, and yet has a tensile strength at the point of breaking of quite 200 pounds. The box containing the reel revolves upon the table beneath, thus permitting the wire to lead off to the kite in whatever direction it may take.

The unwinding of the wire under the pull of the kite is perfectly and easily controlled by a brake, the lever of which is seen projecting to the right in the figure. A spring attached to one of the crank handles enables the pull of the kite, in pounds, to be determined. Certain dials arranged on the axle of the drum give the amount of wire out to the kite, and finally, the inclination of the wire is shown by means of a graduated arc and radius rod, seen over the drum in the figure.

A matter of great importance in the construction of a kite reel is to secure sufficient strength in the rim to withstand the enormous cumulative pressure exerted by a large amount of wire wound in under great tension. A single turn of wire around the drum under a uniform strain of 50 pounds, for example, tends to produce a compressive stress of 50 pounds at every point around the rim. The next turn, at the same tension, adds 50 pounds to the preceding stress, and so on. Two thousand turns at this rate will, therefore, produce a pressure of 100,000 pounds, or 500 tons. The heavy rim of the cast-iron drum, shown in fig. 51, is calculated to safely resist a crushing pressure of fully 1,000 tons. In actual practice the crushing pressure is not quite so great as that calculated by the process indicated above, because the material of the reel yields a little as the pressure increases, and this lessens the tension on the turns of wire already wound on the drum. The side flanges of the drum must also be very strong, as the wire crowds sidewise against these with great force. It is best on this account not to wind the wire on in smooth and even layers, but rather to crisscross the turns of wire slightly, but in a regular manner. Wound in this way, the wire tends to support itself, even without side flanges; at any rate, the lateral pressure is greatly reduced, and, moreover, the outside turns of wire are not able to squeeze down through what is already wound on the reel, as they tend to do when the wire is wound in an even manner like thread on a spool.

When flying at an elevation of from 5,000 to 7,000 feet, one of the Weather Bureau kites, supporting its instrument, will pull from 60 to 80 pounds, if not more, and from 8,000 to 10,000 feet of wire will be out. To wind all this wire in under such conditions is really a very laborious operation, and generally requires two men at pretty hard work for from a half to three-quarters of an hour or more.

In fig. 52 the automatic hand or steam kite reel, designed by the writer for use at the central station just outside of Washington, D. C., is seen as it appears completely housed and not in use. The reel, with a portion of the engine arranged for service, is shown in Pl. XIV, fig. 1.

The drum is of the same strength and construction as the one shown in fig. 51 and can be operated by hand by aid of cranks, which can be applied or detached at any moment desired. One is seen in Pl. XIV,

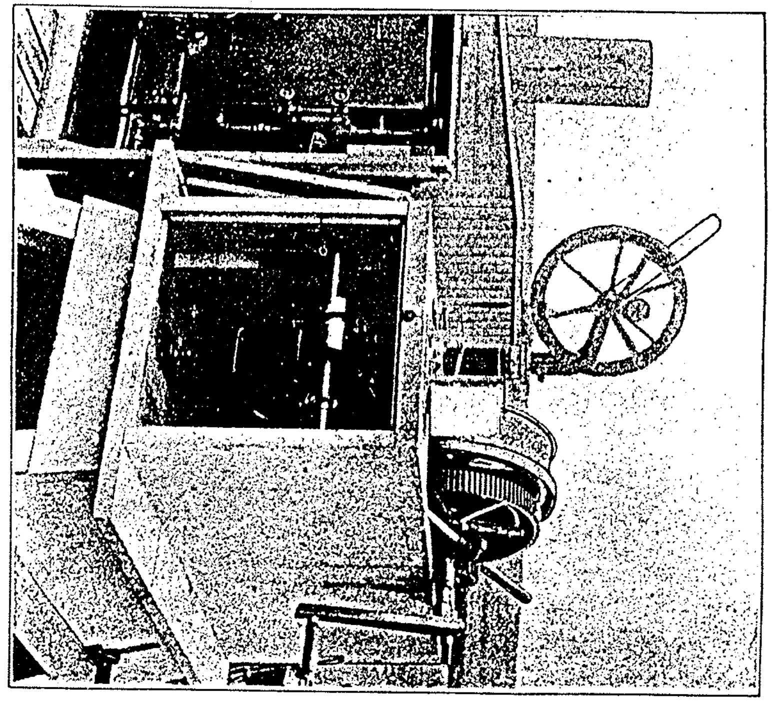

FIG. 1.—AUTOMATIC KITE REEL, ARRANGED FOR SERVICE.

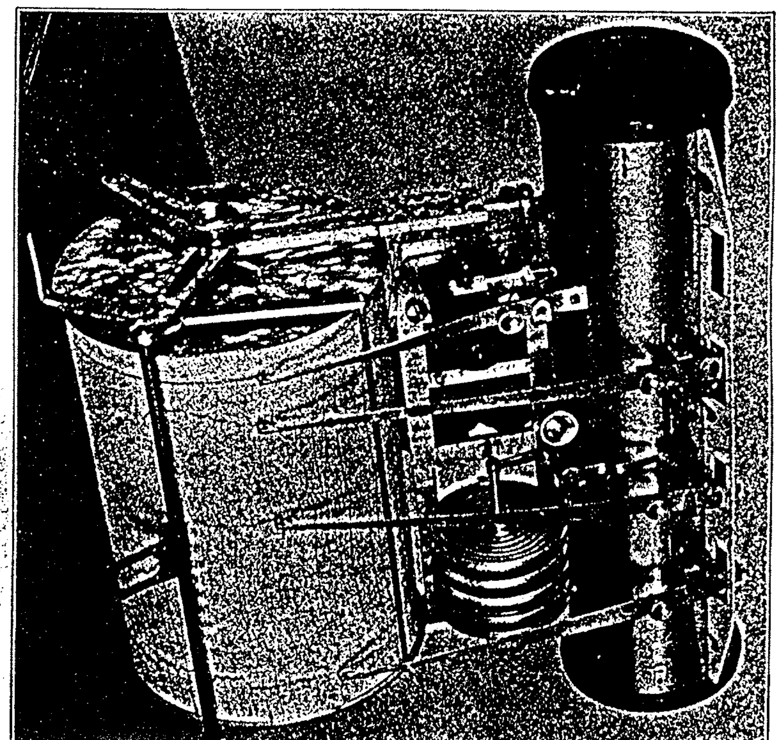

FIG. 2.—KITE METEOROGRAPH (MARVIN).

fig. 1, on the end of the axis of the drum. It is usually employed in this position to aid in starting a kite in flight during light winds. The crank can also be operated on the end of the shaft, seen a little farther back in the same figure. In this position of the crank the drum is driven indirectly, but with increased power, by means of the gearing shown.

In a favorable wind the tension on the line is more than sufficient to unwind the wire and the ascension of the kite is then controlled by means of the lever projecting upward at an angle in the rear of the drum. This operates the strap-iron brake fitted around the flange of the drum, and a very gentle pressure suffices to regulate the speed of the drum or to stop it completely even with the wire under the greatest tension.

Ordinarily, the work of winding in the line is done with the engine, the main shaft of which is extended across the reel box close to the floor. A belt from this runs the shaft carrying the small gear wheel. The large gear wheel runs loose on the axis of the drum, but when it is desired to wind in wire a lever at the back of the reel, not seen in Pl. XIV, fig. 1, is gradually shifted, thereby slowly starting the drum into revolution by means of a friction-clutch connecting it to the large gear wheel.

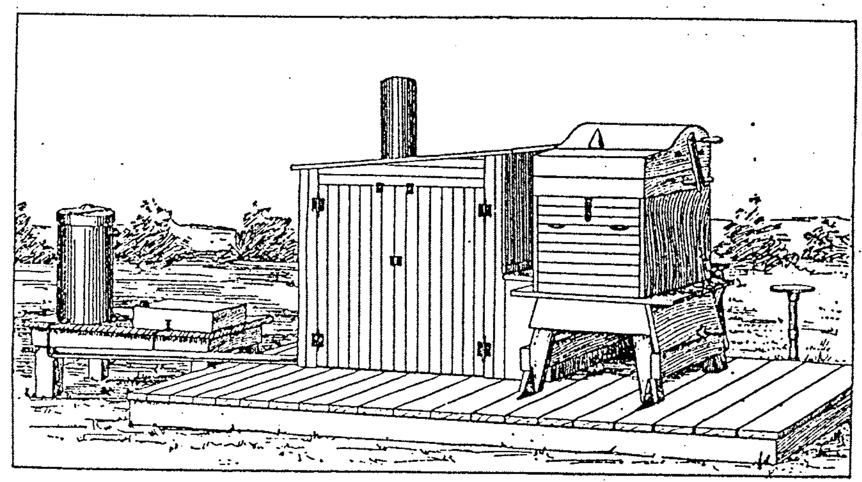

FIG. 52.—Automatic hand or steam reel housed.

The arrangement of wheels seen in Pl. XIV, fig. 1, in front of the drum serves several purposes. The wire from the drum passes first downward and underneath the dynamometer and distributing wheel, thence up through the hollow support of the wheel seen at the top of the figure, over which the wire passes out to the kite. This latter wheel is free to turn, castor fashion, on ball bearings, about a vertical axis and align itself to the direction of the kite.

The first wheel inside the box, around which the wire passes, is mounted in a pivoted frame governed by springs. The pull of the wire stretches the springs more or less, and the corresponding motion of the pivoted frame is communicated to the index and recording pen of the dynamograph, the recording cylinder of which, with some of the details, can be seen in the front of the figure. By this arrangement the tension on the line is indicated and can be continuously recorded at all times, no matter whether the wire is in motion either way or standing still.

Furthermore, this same wheel in its pivoted frame is so mounted as to oscillate laterally in a regular manner, thereby guiding and distributing the wire over the surface of the drum in a prescribed manner. The oscillating motion is given to the wheel by means of the cam, plainly seen in the figure. For the reasons already given, the guiding mechanisms distribute the wire in a crisscross fashion, so arranged that the turning point at the flanges of the drum occur successively at different points around the circumference, thus avoiding the heaping up of the wire at certain points.

The wheel at the top of the figure is just 3 feet in circumference, and serves to indicate the length of wire out by means of a suitable dial mounted at its axis. The length of the wire is also indicated by another set of dials operated directly from the axis of the main drum.

The bent radial arm and graduated arc, seen attached to the top wheel, are employed to measure the angular inclination of the wire as it leads off to the kite.

THE METEOROGRAPH.

The instrument sent up with the kite to secure the automatic record of the conditions of the air is called a meteorograph. It is quite a complicated and remarkable affair, and withal, is very light, weighing only about 2.1 pounds. The instrument is seen in fig. 50 as it appears attached to the kite and inclosed within its light, aluminum case. Pl. XIV, fig. 2, shows the mechanism inside the case.

The sheet upon which the record is produced is wound around the cylinder seen at the bottom of the figure. A clock-work inside the cylinder causes it to revolve at a slow and uniform rate of one revolution in twelve hours.

Four different meteorological conditions are recorded by the four pens of this instrument. The pen on the right traces a line on the paper which shows the humidity of the air, the pen being actuated by a strand of human hairs stretched inside the long tube seen at the top of the figure. These hairs have the property of lengthening when subjected to moist air and shortening in dry air.

The next pen toward the left traces a line upon the record sheet, which shows the pressure of the air, the pen being actuated by the gang of five round, thin, objects seen between the pressure and humidity pens in the figure.

The next pen in order traces a line showing the temperature of the air, which acts upon a special form of thermometer contained within the long tube at the top. When the instrument is attached to the kite the wind blows directly through this tube, thereby acting strongly upon both the thermometer and the hair hygrometer inside.

The pen at the extreme left is designed to record, electrically, the velocity of the wind. For this purpose a small anemometer, not shown in any of the illustrations, is fixed to the kite and connected to the instrument by wires. The pen will then make little marks on the record sheet corresponding to every 2 miles of wind movement.

OBJECTS OF EXPLORATIONS.

A very few remarks will show the great importance in meteorological studies and weather forecasting of such observations as can be obtained by means of kites. These give the conditions prevailing in the free atmosphere, often in and above the clouds themselves, at points far removed from the disturbing effects of great cities, forests, the earth's surface, etc. In fact, observations thus obtained are truly characteristic conditions of great masses of the atmosphere, and when regularly and completely determined they afford far more exact and probably earlier indications of important forthcoming atmospheric changes than the most elaborate observations taken at the surface. The tops of our highest buildings are, after all, but an insignificant distance up in the free air, and all surface conditions are always modified as a result of the actual contact of the air with the earth and the immediate effect of the latter upon adjacent portions of the air.

CONSTRUCTION OF A MODERN KITE.

As some of the readers of this paper may desire to build and fly a good tailless kite of modern type, a simple method of constructing a small-sized cellular kite for pleasure purposes is given in detail. Fig. 53 shows a perspective view of the kite complete.

THE STICKS.

The sticks are best made of straight-grained spruce, but white pine also answers very well. Either lonsdale cambric or calico may be used for the covering. Some small tacks and coarse, waxed, linen thread are also required. The sticks should be cut to the following dimensions:

Four longitudinal corner spines, one-fourth of an inch thick, five-eighths of an inch wide, and 40 inches long.

Two central longitudinal spines, three-eighths of an inch square by 40 inches long.

Two short vertical struts, one-fourth of an inch thick, 1 inch wide, and $11\frac{5}{8}$ inches long.

Four diagonal struts, one-fourth of an inch thick, five-eighths of an inch wide, and $37\frac{3}{4}$ inches long.

notches will stand in proper relation. Referring to fig. 55, it will be recalled that the small notch at one end of each spine is nearer the end than at the opposite end. In tacking the spines to the cloth, all that is necessary is that one pair of spines in opposite corners shall have the notches the shorter distance from the end and the notches of the other pair be at the longer distance. In other words, for example, tack short-ended spines in the *C* and *D* corners, as they appear in fig. 53; then the long ends of the remaining spines must occupy the *E* and *F* corners of fig. 53. When so arranged, one diagonal strut stepped in the notches will pass in front of and the other behind the uprights of the central truss.

All that now remains to be done is to fit up the diagonal struts. Fig. 56 shows a finished diagonal strut. It is difficult to determine beforehand the exact length these should be, because the amount the cloth bands will stretch is uncertain. The length indicated in fig. 56 is about right, if all the other dimensions specified herein are carefully adhered to. Make up a pair of the struts about a half inch too long at first, then, by trying them in the kite and cutting out the notches deeper and deeper, a perfectly satisfactory fit can be secured and the cloth braced out smooth and taut. Care must be taken to

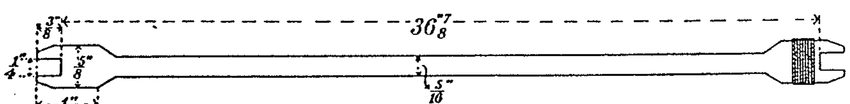

FIG. 56.- Diagonal strut.

keep the two struts of the same pair the same length. This fitting had best be done before reducing the cross section of the sticks between the ends. The enlarged ends, when finished, should have about the dimensions shown in fig. 56; then, to prevent the forks from splitting off, it is quite necessary to lash the ends just back of the notch with a serving of good, waxed thread. Instead of cutting these struts out of a solid piece, as described above, some may prefer to build up the enlargements at the end by gluing on small cleats, finally lashing the waxed thread over all as before.

It is understood, of course, that the diagonal struts are to be inserted within the cells of the kite, so that the notched ends enter the shallow notches of the corner spines, shown at *a* and *b*, fig. 55. One diagonal strut passes in front of, and the other behind, the upright of the central truss in each cell, and the three sticks are firmly bound together at the point of crossing with waxed thread.

METHODS OF BRIDLING.

Two methods of bridling the kite will be described. Cut off about 6 feet of stout cord and tie one end to the central truss at *A*, as shown in fig. 54, the cord passing through small holes pierced in the cloth

covering. The knot employed at this point is shown enlarged at *A*, fig. 57. The flying line should be tied to the free end of this cord by means of bowline knots, as shown at *B*, fig. 57. This knot is strong,

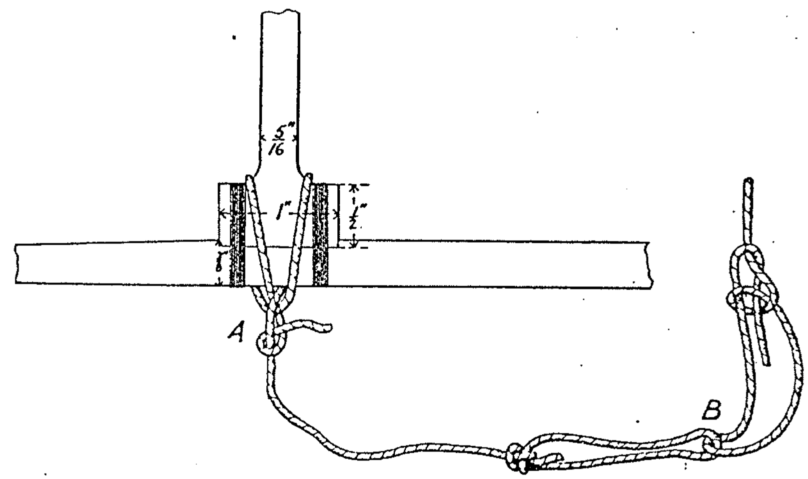

FIG. 57.—First form of bridle.

never slips, and can be easily untied, no matter how much the line may have been strained.

The one-point attachment of bridle, described above, is better suited to strong than light winds, and sometimes in lighter winds it may be

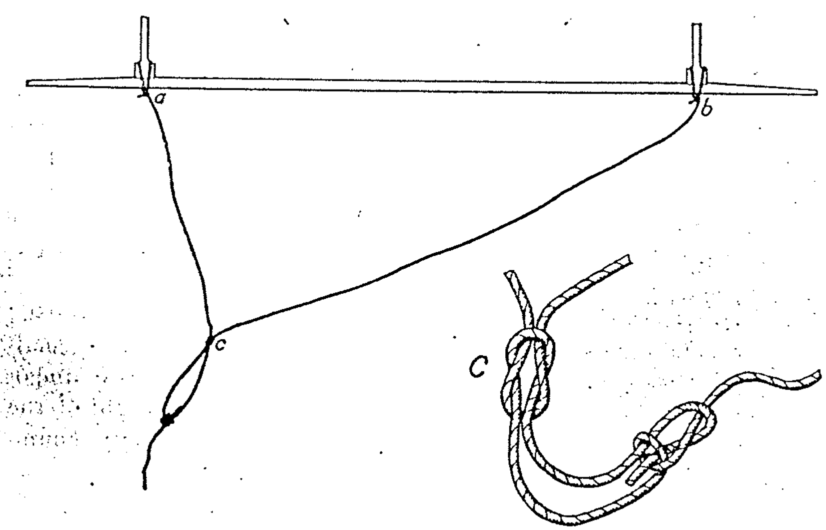

FIG. 58.—Second form of bridle; c, enlarged knot (loosened).

more satisfactory to employ the two-point attachment of bridle shown in fig. 58. In this the free end of the 6-foot piece of cord is shown tied to the central truss at *b*, thus forming the bridle *a*, *b*, *c*; the main line being attached at the point *c* by a kind of knot shown enlarged at one side. This will not slip of itself, but the point of attachment can easily be adjusted as may be desired.

To be perfectly safe, the flying line for this kite should have a tensile strength of from 50 to 60 pounds and be equally strong throughout. During light winds a finer line will answer, but strong currents are frequently encountered as the kite ascends, and a weaker line than specified above is likely to be broken.

FLYING THE KITE.

If the wind is favorable for flying, the best way to start the kite in flight is to run out 150 feet or so of twine while the kite is held by an assistant. When all is ready, the assistant may toss the kite upward a little in the direction in which it is to go. It will take care of itself afterwards. It is important the kite be cast off directly in line with the wind, otherwise it may seem to dart badly. When fairly up the kite may sweep a little from side to side, but if it ever darts or turns over, there is something radically wrong, probably due to an uneven distribution of the cloth surface, or some permanent distortion of the framework. Sometimes the weight of the wood varies, and one side is heavier than the other. This should be corrected by weighting the light side with a small strip of sheet lead, or otherwise.

If the wind is very light, a finer twine may be used in flying, and it may be necessary to run a little with a long string out, in order to get the kite into upper and more rapidly moving currents.

When the wind is very strong, drop the ball of twine on the ground so that the cord can pay out rapidly, and let the kite go up directly and quickly from the hand.

TANDEM KITES.

Several kites can be sent up on the same line. When an additional kite is to be sent up, it must be first carried out, say, 100 feet, attached to a separate line of that length, the end being tied to a loop formed in the main line. When all is ready, the kite is tossed up, as already described.

UTILIZATION OF RESIDUES FROM BEET-SUGAR MANUFACTURE IN CATTLE FEEDING.

By Guilford L. Spencer,
Assistant in Division of Chemistry.

PULP FEEDING IN EUROPE.

In visiting the sugar-beet farms of Europe, the excellent condition of the beef and dairy cattle is quite noticeable. This desirable result is in a large measure attributable to feeding the beet pulps from the sugar factories to the cattle. In addition to the pulps, a small proportion of molasses is also often fed.

It is customary in Europe, especially in Germany, to guaranty a certain proportion of pulp to each farmer who is a shareholder in the factory, as part compensation for his beets, and to pay other farmers not receiving pulp a somewhat higher price, approximately 75 cents per ton. The shareholders contract to furnish the beets from a certain area, and can depend upon receiving pulp in proportion to this acreage. The beet pulp is, moreover, in such demand that farmers not shareholders contract to plant a certain acreage to beets, and are then also supplied pulp as part compensation.

The pulp is especially prized in the sugar-producing sections for feeding milch cows. The general results of such feeding are a large flow of rich milk and the production of butter of good flavor.

RESIDUES FROM BEET-SUGAR MANUFACTURE.

In the sugar-beet industry the roots are topped in the fields prior to transportation to the factory, and the crown of the beet is removed by means of a sharp, heavy knife applied at or near the lowest leaf scar. Experience and chemical tests have demonstrated that there is a tendency for various salts to accumulate in the crown of the beet in greater quantities than in other parts of the root. Many of the salts retard the crystallization of the sugar in the manufacturing processes, and increase the production of molasses. It is for this reason that the manufacturers are very strict in their specifications relative to topping.

The tops, or crowns, may therefore be considered among the residues of the manufacture. They may be fed to cattle, but with hardly as satisfactory results as would be obtained by feeding the entire beet, owing to the large proportion of salts. In view of the necessity of