RAILROAD CAR WHEELS.

There appears to be no record which shows the first form adopted for the flanges of railroad wheels, nor of the shapes which they have gradually assumed. Wood's treatise on railroads and Pambour's book on locomotives contain sections of tires, the form of which does not differ materially from those now in use. These were published in 1836 and 1838. The fact seems to be that the present shape of flanges and also of rails has been assumed to be right without any good or sufficient reason for it, excepting that it worked well in practice. In other words, there are no adequate reasons for inferring that the present form of wheel flange is the best that is possible. It has been adopted empirically, and there is no sound theory to recommend it. It seems quite within the range of possibility that an elaborate investigation might indicate some important and valuable modifications in the form of these very important parts of all railroad vehicles.

There are more than 10,000,000 car-wheels in use in the United States, the average life of a wheel is eight years, and it requires a little over a ton of pig iron to make four wheels. Hence, assuming that the number of wheels in use is even 10,000,000, it requires 1,250,000 new wheels to replace those worn out each year, and to make these over 312,500 tons of pig iron are required. As 1,250,000 wheels are worn out each year, and as the average weight of a worn out wheel is about 515 lbs., something like 287,389 tons of this old material are available for remanufacture. The difference between this sum and 312,500—the approximate weight of the new wheels—shows pretty correctly the number of tons of new material consumed per year in the manufacture of car wheels, assuming that all the old wheels are manufactured into new ones. The difference is 25,111. The life of a car wheel is, however, growing shorter, for two reasons: 1. The increasing weight of a carload, the load on some roads now being double what it was a few years ago; and second, better management and improved loading and unloading facilities, by which the wheels are kept moving more continuously than formerly. As an instance, a train loaded with petroleum can be unloaded at New York in a very small fraction of the time required before the excellent facilities for discharging were provided. Manufacturers guarantee wheels to run from 50,000 to 60,000 miles, but they not unfrequently greatly exceed this.

DEMAND FOR GAS ENGINES.—Those connected with the manufacture of illuminating gas in this country appear to be gradually coming to a sense of the necessity of building up additional markets for their product. They are now making strong efforts to aid the introduction of gas engines. At a recent meeting of the Western Gas Association, at Indianapolis, Mr. J. O. King, president, in his address stated that the demand for gas engines is so great that manufacturers are unable to meet it with any promptness. Mr. Ramsdell, of Vincennes, Ind., speaking on the subject, gave a brief account of the experience which he had had with the Otto silent gas engine. A 17-horse power engine operated two elevator belts, lifting the grain in 8 and 12-inch buckets 60 ft. high, 10-inch conveyers 135 ft. in length, one wheat cleaner and fan and one pump. To do this it consumed 200 cubic ft. of gas per hour. The chief advantage brought out was that it is admirably adapted for light and intermittent work. In addition to this wheat machinery there was complete machinery for handling corn, besides the elevator and conveyers, used also for the wheat, one No. 2 corn sheller and machinery, etc. Another, a 1½-horse power engine, operated the machinery of a local newspaper, from three to four hours a day, at a consumption of 1,000 cubic ft. of gas per month. The gas engineers, it seems, are considerably impressed with the importance of the subject.

SIGNAL SERVICE WEATHER CASE.

The extension of the U. S. Signal Service has proved of great value to all our outdoor industries. The great trouble in bringing its results to bear upon agriculture has been the difficulty of making known forecasts, etc., to those remote from the cities or large towns. Gen. Myer, Chief of the Service, now has it in mind to issue a compact arrangement of meteorological devices so that those distant from centers of information may have some means for arriving at better judgments of coming weather than they now have. Of course it is not pretended that any device will give infallible forecasts, but the design is to bring the best modern means of judging within the reach of all, that the benefits of the government service may be widely disseminated.

Our engraving on the next page represents the "weather case or farmers' weather indicator," which will be set up ere long in rural postoffices throughout the country. The case is 31 inches high, 13¾ inches wide and 4¼ inches thick. The front is covered with a glass door, which is kept closed except when making observations and adjusting the different instruments. The engraving, which of course presents the weather case in miniature, is worthy of careful study and a leisure hour will be required to arrive at a full understanding of its plan and details. We shall give as full a description of the different parts and their uses as we have space for at this time, as we deem the subject one of general importance. We understand that the cases are not for sale, but are to be erected here and there at government expense for the public benefit.

The pointer or index at the top of the case (No. 1) slides on the brass arc; it is known as the "sunset barometer index," and indicates, when set, by the figures to which it points on the "main barometer scale," which is just below it, the reading of the barometer at the time of the sunset yesterday. The "main barometer scale" (No. 2) exhibits all the barometric readings likely to be used with this instrument. The pointer (No. 3) just below the "main barometer scale" is called the "reference index," and indicates by the figures to which it points on the main barometer scale, when the instrument is set, the mean or average reading of the barometer at the *place* at which the instrument is set and for each separate *month*. When the barometer reads above or below this reading at any place, such reading is said to be "above the mean" or "below the mean" for that place in that month. This reference index is established in the exact central line of the face of the case. The long brass hand over the glass face of the barometer is known as the "long pointer," and indicates, by the figures of the "main barometer scale" to which it points when set, the reading of the barometer when last set. The black pointer on the face of the barometer under the glass face is known as the "short pointer," and indicates the existing pressure of the atmosphere at any time the instrument may be examined.

There are for each place and each month two kinds of winds: First—Winds which, blowing from certain directions, are at that place and in that month more likely than other winds to be followed by rain. These are called "rain winds." Second—Winds which, blowing from certain directions, are at that place and in that month less likely than other winds to be followed by rain. These are called "dry winds." The wind direction for any day or time must be seen and taken at each place or station by a vane as well located as practicable. The "wind disk" (No. 8) consists of a brass circle, on which slide freely two arcs—a red arc, called the "dry wind arc" (No. 9), and a blue arc, called the "rain wind arc" (No. 11). In the center of the disk is a pointer turning with a turning-screw, and called the "wind disk pointer" (No. 10). Around the disk are letters to show directions, as N. for north, E. for east, NE. for northeast, etc.

The pointer and scale (No. 5) on the right of and below the barometer are called the dry-wind time record, and the pointer (No. 7) is called the "record pointer," and indicates, when set, the length of time the wind has been blowing continuously from a "dry" direction, by the figures showing the number of hours on the scale to which it points.

The pointer and scale (No. 4) on the left of and below the barometer are called the rain-wind time record, and the record pointer (No. 6) indicates, when set, the length of time the wind has been blowing continuously from a "rain" direction, by the figures showing the number of hours on the scale to which it points.

The record pointer on the rain-wind time record (No. 6) is always turned by the thumb-screw, and set pointing at the figure 0 on the scale when the wind is not blowing in the rain-wind direction. In the same way the "record pointer" on the dry-wind time record (No. 7) is always set pointing at the figure 0 when the wind is not blowing in the dry direction.

The sunset disk (No. 12) consists of a circular disk one-half of which is colored red and one-half of which is colored blue. The disk turns upon a central turning screw in such a manner that half of the disk shows through a semi-circular opening in the face of the weather case. The sunset disk is set as follows: At the exact time of every sunset the western sky and the character of the sunset is carefully observed. The examination ought to be minute and careful, lasting for about fifteen minutes. If the sunset sky is clear or red, or markedly what is known as a "fair weather sunset"—a sunset such as is generally held to indicate a clear or fair day to follow on the next day—a day on which it will not rain—the sunset disk is turned by the turning screw until the semi-circular opening shows all red. The sunset disk, thus turned, is described as set for a "fair weather sunset."

If the sunset sky (the western) is cloudy or foul, or markedly what is known as a "foul weather sunset," a sunset such as is generally held to indicate foul weather to follow on the next day—a day on which it will rain—the sunset disk is turned by the turning screw until the semi-circular opening shows all blue. The sunset disk thus turned is described as set for a "foul weather sunset." If the appearance of the western sky and the character of the sunset are neither markedly those of a "fair weather sunset" or of a "foul weather sunset," but such as to leave the observer in doubt how to style it, the sunset disk is turned to show half red and half blue, or "doubtful." The sunset disk, thus set, is described as set for a "doubtful weather sunset."

In the lower part of the weather case there are two thermometers, a dry bulb thermometer (No. 13) on the left hand side of the case, and a wet bulb thermometer (No. 14) on the right hand side. The dry bulb thermometer is like any other thermometer, and shows by its readings the temperature of the air. The wet bulb thermometer is one, the bulb of which is kept constantly moist by the water passing up from the glass reservoir, through the wicking which covers the thermometer bulb. The readings of the dry bulb thermometer and those of the wet bulb thermometer are more and more unlike, or father and farther "*apart*," as it is called, in proportion as the air contains less and less moisture, that is, is becoming *drier*. The readings of the dry bulb thermometer and those of the wet bulb thermometer become more and more *alike*—are nearer and nearer together—in proportion as the air contains more and more *moisture*. That is, is becoming saturated or *wet*.

By the side of the dry bulb thermometer (No. 13) is the dry bulb pointer which slides on the brass slide (No. 15). By the side of the wet bulb thermometer is the wet bulb pointer which slides on the brass slide (No. 16). In the center of the case is the "dry and wet bulb scale," marked on the paper on which is the central brass slide bar (No. 19), and on this slide move the dry bulb keeper (No. 17) and the wet bulb keeper (No. 18). To set the thermometers examine first the dry bulb thermometer and move the "dry bulb pointer" (No. 15) on the slide