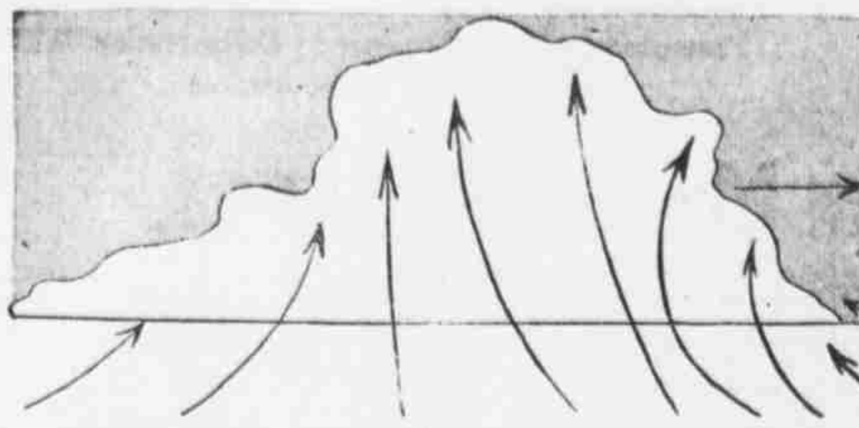
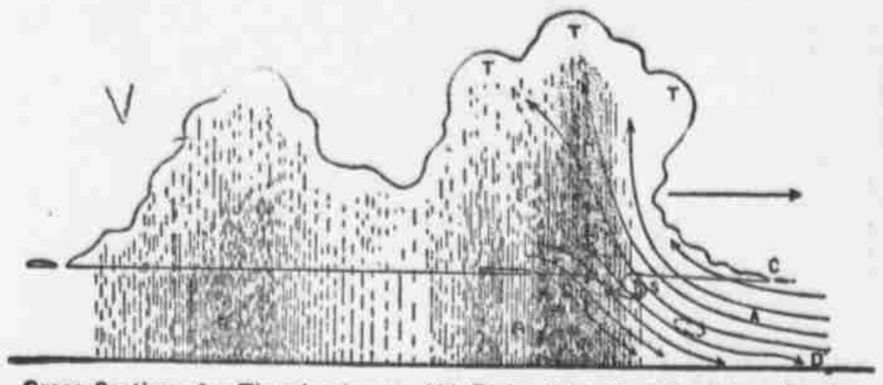
THE OMAHA SUNDAY BEE MAGAZINE PAGE

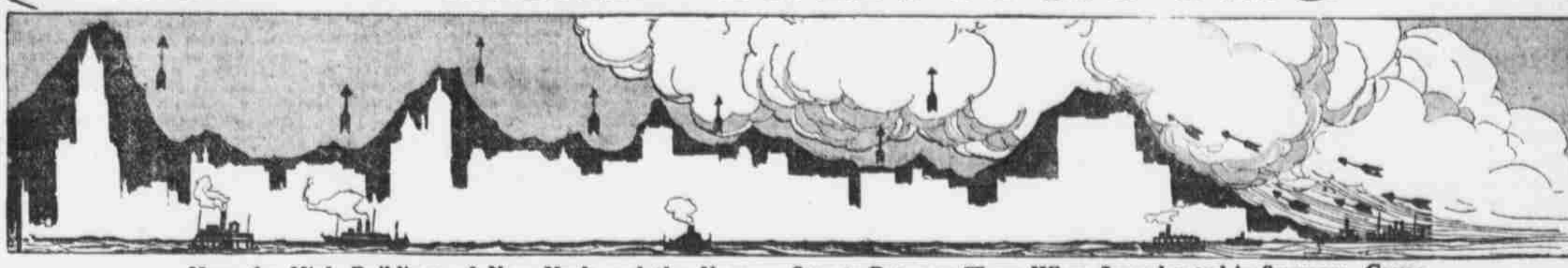


How the Rising Hot Air Currents Start the Formation of a Thunderstorm.

Why We Have Thunder Storms On Hot Summer Afternoons

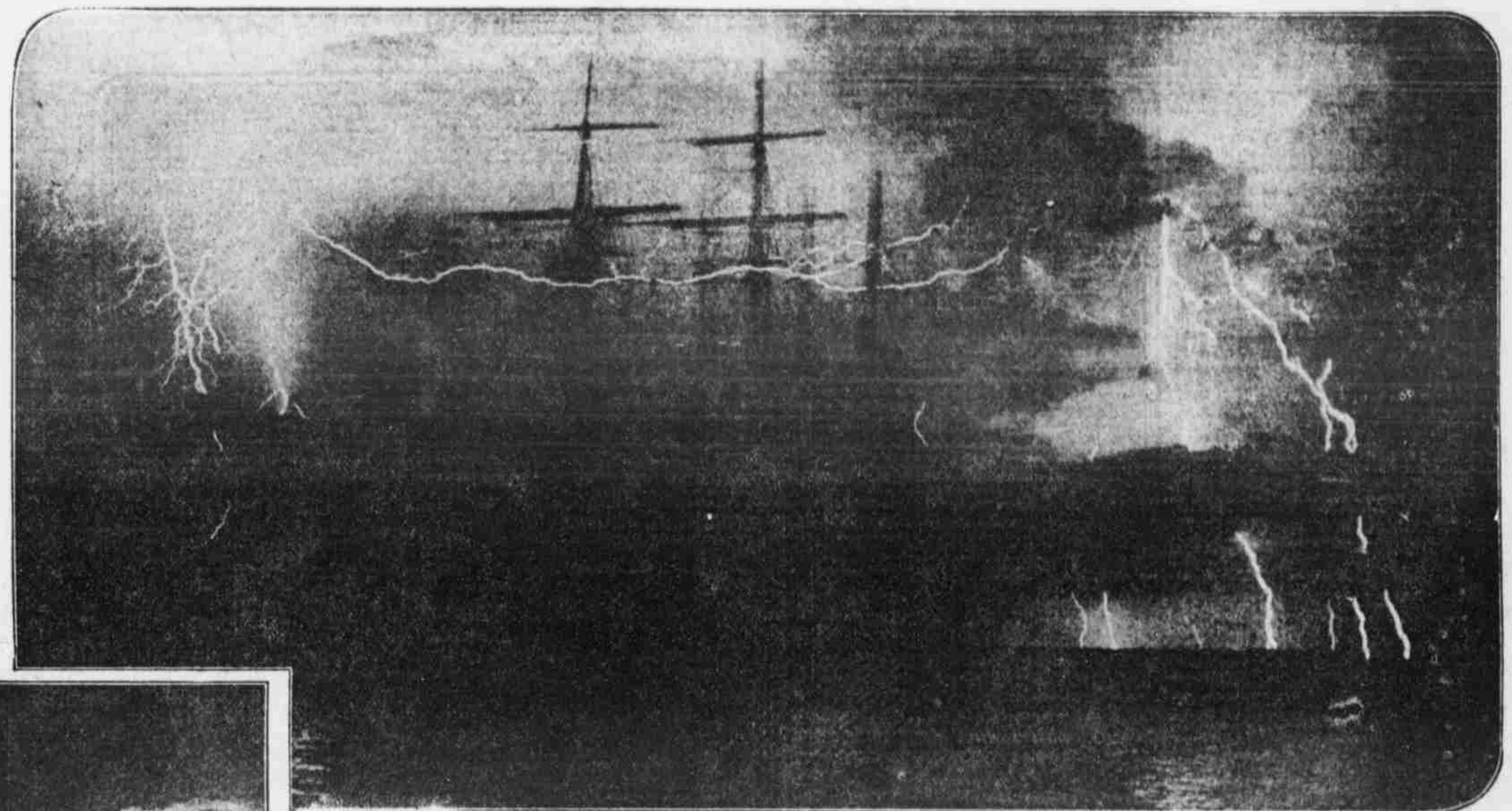


Cross Section of a Thunderstorm. (A) Rising Hot Air Currents. (B) Decending Cold Air Currents. (C) The Storm Collar, a Constriction Which Produces Violent Winds. (S) The Roll Scud, or Hot Air Driven Upwards by the Cold Descending Current. (D) Wind Gust. (H) Hail Produced by Ice Particles Blown Up and Down in the Cloud. (T) Where the Thunder and Lightning Appear. (R) Rain in the Thunder Cloud (R1) Rain Produced in Adjacent Cloud.



How the High Buildings of New York and the Narrow Streets Between Them When Superheated in Summer Cause Particularly Violent Thunderstorms.

Science at Last Penetrates the Mystery of Cyclones, Tornadoes, Cloud-Bursts, Thunder and Lightning, Which Have Heretofore Been Puzzling Mysteries



Remarkable Lightning Effects Photographed During a Thunderstorm at Sea.

WHY do we have thunderstorms toward the close of a hot Summer's afternoon?

Many features of this familiar occurrence have not been clear even to scientists, and Professor William J. Humphreys, the well-known meteorologist of the United States Government, has recently furnished some interesting information on the subject. The rain of the thunderstorm occurs because the earth, heated much more rapidly than the upper air on a hot Summer's day, sends a violent current of hot surface air into the upper region. This current gathers moisture as it rises, is finally cooled, and then falls in the form of rain.

Why thunder and lightning accompany the storm is a more obscure matter, and is explained by Professor Humphreys by a description of a recent experiment in which a minute thunderstorm was produced. The experimenter allowed drops of distilled water to fall through a vertical blast of air of sufficient strength to produce spray. From this the following facts were ascertained: 1. The breaking of drops of water is accompanied by the production of both negative and positive ions (the particles of which electricity is composed). 2. Three times as many negative ions as positive are released.

Now this experiment closely reproduces the conditions that produce a thunderstorm. Such a storm is characterized by strong upward currents of hot air, and these are strong enough to account for the breaking up of all rain drops which would otherwise fall through them. Hence at the top of the uprushing air current of the storm, i. e., within the thundercloud, a rapid electrical separation goes on, the first result of which is positively charged rain drops and free negative particles. The positive charges of the rain drops are continually increased by the successive division and union of the drops. These positively charged drops fall to the earth whenever the air current becomes weak enough to permit their passage.

The negative particles are carried up into the higher part of the cloud, where they unite with the cloud particles and facilitate their formation into negatively charged drops. These ultimately fall in the gentler rain of the storm. The reunion of the two separated forms of electricity produces lightning.

Any weather condition in which a layer of warm air is beneath a layer of cold air is likely to give rise to a thunderstorm if the temperature contrast be strong enough. Such a situation is unstable and leads to the violent moving about of different strata of the air, which is the essential feature of a thunderstorm.

The storm may arise from intense local heating of the earth's surface, in which case it is knows as a local or heat thunderstorm, or from the over-running of one layer of air by another at a different temperature. Thunderstorms may also result from the under-running, and consequent uplift, of a saturated layer of air by a denser layer.

Non-local types of thunderstorms are classified by the weather experts as cyclonic, tornadic, anti-cyclonic and border thunderstorms, according to their position with respect to cyclonic and anti-cyclonic formations in the atmosphere. A line or row of tornadic storms extending from a cyclonic centre constitute the well-known "line squall."

On land thunderstorms occur most frequently in the early afternoon and in Summer, and at sea they are most frequent at night and in Winter. This is because the relative temperature of the air as compared with land and with water at the two seasons is reversed. Thunderstorms are more frequent in warm and wet years than in cold and dry ones. Heat is the determining factor in producing them, and consequently they are most frequent at the period of minimum sun spots and least frequent at times of maximum sun spots.

Professor Humphreys explains the structure of a typical thunderstorm in a very interesting manner. First we have air

Photograph of a Thunderstorm in Course of Formation Taken from a Balloon.

flowing in from all sides, rising, cooling by expansion, and building up the thundercloud. As a result of this process rain is formed at a considerable altitude where the air is quite cold—in fact, so cold that hail is often formed. This cold rain, or a combination of rain and hail, as it falls to the earth, chills the air all the way down to the ground, partly as a result of its low temperature at the start, and partly because of the evaporation that takes place during its fall. This cold current of air is correspondingly dense and becomes a strong downward current. The frictional drag of the falling rain is an additional factor in giving it this downward movement.

The current plunges down and at the same time is carried forward by the general movement of the storm, under-running and buoying up the warm adjacent air in front. This current is a typical thunder-squall, which rushes forward from an approaching thunderstorm, agreeably cooling the air.

Between the uprising sheet of warm air and the adjacent descending sheet of cold air horizontal funnels are formed, in which the two currents are more or less mixed. These become visible at a point near the front lower edge of the main thundercloud, where the rising air has so nearly reached the rain point that the somewhat lower temperature produced by the admixture of the descending cold air is sufficient to produce a fog-like condensation. This constitutes what weather experts call a "squall cloud" or "roll scud."

These are the stages of a thunderstorm in order: (1) An abrupt fall of temperature, due to the rain-cooled descending current; (2) a sharp rise of barometic temperature, which Professor Humphreys believes to be due to lower temperature, decreasing humidity and other more obscure factors; (3) a violent gust of wind or thunder squall, already referred to; and (4) initial heavy rain of the storm.

The name of "rain gush" is given to a sudden acceleration in rainfall immediately following a heavy clap of thunder. The explanation is that excessive condensation in the thunder cloud leads to a local excess of electrification and electrical discharge, since the latter processes depend upon the presence and abundance of water drops. Hence excessive condensation or rain formation really precedes the thunder clap, but as sound travels faster than rain falls we hear the thunder before the rain gush reaches us.

When the descending current of rain is very heavy, the drops being so large and close together that they form an almost continuous sheet of water, we have what is known as "a cloudburst." They usually occur over very dry sections of country which have sent an unusually strong hot-air current rushing up into the cold-air region. Cloudbursts are often very destructive, especially in hilly country, where the entire fall of water flow suddenly into the nearby valley.

Hail, which is a phenomenon of severe thunderstorms, consists of roughly concentric layers of snow and ice. It can only be formed in the upper part of a thunder cloud, where both snowflakes and excessively cooled water drops are present. The nucleus of the hailstone having been formed in this cold region gets into one of the upper weaker updrafts of the storm and falls to the level of liquid drops, where its own low temperature enables it to gather a coating of ice. Presently a more violent upward puff carries it aloft again, and it acquires a coating of snow. This process may be repeated several times, until the hailstone is too heavy to be supported by ascending currents and falls to earth.

Recent photographs of the lightning flash by scientific observers have done much to elucidate the real shape of this startling phenomenon. It is now known that the old, popular and artistic conception of a zig-zag streak of lightning is mistaken, and that the flash has several typical forms, all quite different from this conception. The fact is, of course, that a lightning flash is so dazzling that the human eye cannot obtain an accurate impression of it.

The photographs show that most often the lightning flash fills itself up gradually, and consists of several successive discharges along the same path. The discharge differs from that of an electrical machine in one important respect—the distribution of the charge. In the case of the machine this takes place almost wholly on the surface of the apparatus, while in that of lightning it is irregularly distributed throughout the cloud. In both cases, however, the air must be charged with particles of one kind of electricity before the discharge can take place freely. This condition at times seems to establish itself gradually.

According to Professor Humphreys's view the lightning spark, once started, "ionizes" the air and makes its own conductor as it goes. A similar condition can be produced on a photographic plate by bringing in contact with the film some distance apart two conducting points attached to the opposite poles of an electrical machine. "Brush" discharges develop about each point, but the glow at the negative pole detaches itself and slowly meanders across the plate toward the positive point. This explanation furnishes a possible clue to the cause of "rocket lightning," which is a flash progressing slowly across the sky line a sky-rocket and of "ball lightning."

Professor Humphreys has investigated the question whether lightning is unidirectional, i. e., flowing in one direction or oscillatory. He has come to the conclusion that it is unidirectional, for the following reasons: (1) Lightning operates telegraph instruments; if these discharges were alternating it would not be so; (2) at times it reverses the polarity of dynamos; this requires a direct and not a high-frequency alternating discharge; (3) the oscillograph shows each surge or pulsation, as well as the whole flash, to be flowing in one direction.

If the day grows excessively warm and toward evening the clouds seem to rest on the western horizon and become grayish at the base, if the wind dies away and the atmosphere seems unusually quiet, it is the best evidence of a coming thunderstorm.

Thunderstorms are more dangerous over waterways than over dry land, because water is a good conductor of electricity. Over a river the lines of electrical force are concentrated between the low-lying clouds and the water, which creates an electrical disturbance of greater energy than is observed over the land.

A cyclone occurs at an area of low pressure—that is, where the atmospheric pressure is least, or where the barometer reads the lowest, and is nothing more or less than a comparative vacuum in the atmosphere, into which the winds from all sides blow. The system of winds established by blowing toward the low-pressure centre is called the "cyclonic system," for the reason that they blow spirally inward and upward, with a motion contrary to the direction of movement of the hands of a watch, and when nearing the centre the spiral motion becomes more pronounced.

The storm centre is known by sailors as the "eye of the storm." At the centre of the cyclone the atmosphere for an hour or two in the most extensive storms becomes clear, the clouds disappear, the barometer shows a slight rise, and to all appearances, except to the experienced observer, the storm is practically over. This condition changes after the storm centre passes, when the wind shifts from the easterly quarter from which it has been blowing to a westerly one and attains a greater force.

This peculiar phenomenon is due to the ascending current of air at the storm centre being dissipated by a descending current from higher altitudes, thus preventing the formation of clouds at that point.

The tornado is the smallest and yet the most powerful and destructive of all storms. It is of local origin, limited in width and length of its path. Its chief characteristic is a funnel-shaped cloud, which dips to the earth's surface and has a violent rotary motion. The upper surrounding sky is covered with a mass of black, treacherous-looking clouds. A tornado and a cyclone are very different formations, and are only alike in that each is a storm of whirling motion. The cyclone is a wide-area storm, covering five hundred to two thousand miles, with brisk to high winds extending from its centre to its outer edge. The tornado is only from fifty to a thousand feet wide and usually travels a distance of one hundred to two hundred miles before it is dissipated.

The explanation of a tornado is that when an area of low pressure passes over the country the general circulation of winds from all sides flows toward its centre, which brings the colder, dry winds from the north and west, and the warmer, moist winds from the south and the east into the general circulation of air bearing toward the storm centre.

It is believed that in this rush of warm and cold air there must be a point of meeting where there is a great difference of temperature. In this general case the warmer current underruns the colder layers of air, and in seeking an outlet forces its way through the place of least density, causing a violent upsetting of the atmosphere, which results in the formation of a funnel-shaped cloud of condensation of moisture from the uprushing of warm, moist air. The greater the difference in the temperature between the warmer and colder air layers the greater will be the violence of the rotary motion which takes place at the vortex.

A tornado as it advances produces a terrible roar, which has been compared to the noise of thousands of trains of cars passing through a tunnel at the same time. This terrific noise usually occurs about fifteen minutes before the arrival of the tornado, and gives warning of its approach. It is probably due to friction caused by the violent rotary motion of the tornado funnel.

No power has ever resisted the force of a tornado except a mountain range. To be within the tornado path is almost certain death. On the south side one may stand within a distance of five hundred feet with impunity, but on the north side it is almost certain destruction to be within a thousand feet. The tornado uproots trees, blows down houses, lifts bridges and large buildings from their foundations, blows trains of cars from their tracks and lifts them several feet in the air before overturning them.

Why Many Go-Carts Are So Bad for Babies

THE choice of a vehicle for the baby is a matter of great importance.

The folding cart, which may be taken on the street cars, permits mother and baby to go out many times when it would not otherwise be possible. The great convenience of this cart cannot be denied, but such cars should be used only for the purpose for which they are intended, namely, to convey the baby short distances, and not as pleasure vehicles, nor should the baby be left to sit fastened in one of these small carts for any great length of time.

Some of the go-carts of the present day are so small, so stiff, and so ill adapted to the baby's anatomy that they can hardly be recommended even for temporary use. Also, they are so close to the ground that the child is propelled through only the lower and colder air currents, which fling an unending stream of germ-laden dust off the street into his face.

They frequently have no cover with which to shield the baby from the heat or cold, or sun or wind, and in cold weather it is impossible to keep a baby sufficiently warm in one of them.

The best vehicle for ordinary use about the home is one which is at least two feet high. It should have room for the baby, with the necessary wrappings, in any position, and a cover that can be readily adjusted to secure the needed protection. It should have strong, well-balanced springs and stand squarely on four wheels. A safety strap which fastens about the baby's waist gives greater protection than the ordinary carriage strap.

Carriage outings are, at best, not an unmixed advantage to the baby, although often they afford the only available means of his getting the out-of-door air. The lack of exercise and the more or less rigid position maintained for considerable periods of time serve to tire the baby. Also it is no doubt true that a baby sent out in charge of another child or of some person not altogether competent to judge of his comfort is often neglected. A more wholesome and natural place for the baby to take his airing is in the yard or on the porch, where he can be under the mother's supervision.

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