rise to storms—a diminution of pressure forming a partial vacuum into which the air from all sides rushes, forming the cyclone, with ascending air in its center; while an increase of pressure originates the anti-cyclone, with its descending currents. In general, as Professor Haughton puts it, "*A line of low barometric pressure will correspond to ascending currents in the atmosphere, and a line of high barometric pressure will correspond to descending currents in the atmosphere.*"

The principle of gauging atmospheric waves by the barometer depends on the fact that the column of mercury in its tube always weighs as much as a column of air having the same diameter as the bore of the tube, and reaching from the bottom (or cistern) of the instrument to the uppermost limit of the atmosphere, far above cloudland. Were the tube filled with water, leaving a vacuum in its upper part, the column of water kept up by the air pressing on its base, at the lower end of the tube, would be about 34 feet high near the sea-level, instead of 30 inches, as in the mercury-filled barometer. The principle on which the fluid oscillates with varying pressure depends, of course, on obtaining a vacuum in the top of the barometric tube; the ordinary pump, on the same principle, raises water from the well when a vacuum is created in the pump-log by forcing the pump handle downward.

The simplest form of the barometer is a glass tube of large bore standing vertically in a cistern of mercury, the height of the mercury in the tube above the level of the mercury in the cistern being read off by the aid of a graduated scale placed beside the tube. This is the form of the "Standard" barometer used at Kew Observatory, England. In ordinary barometers the scale (of brass) is attached to the frame in which the tube is secured, the scale having been divided into inches, tenths of inches, and lesser fractions.

Another form of barometer is the "aneroid." In this form of barometer the air pressure is simply measured by its effect on a small, air-tight metallic box (made by soldering together two disks of corrugated German silver), from which the air has been exhausted. When the pressure of the atmosphere is heavier than the normal, the top of the box is pressed inward; when the pressure falls lower, the top of the box is forced outward by a spring which acts in opposition to the movement of the vacuum chamber. These movements of the lid of the metallic box are transmitted by delicate multiplying levers and a small chain to an index, which moves over a circular graduated scale, and thus shows the pressure changes. This instrument is so handy that it may be carried in the pocket.

As the scientific investigation of weather phenomena progresses, there is an increasing need for the employment by all observers of mercurial barometers corrected and frequently compared with a standard. At sea a single faulty barometer may give a reading which when entered on the "weather chart" may prove misleading as to the form and intensity of a cyclone under investigation, while on land a single incorrect barometer reading may deprive the meteorologist of the most important datum he can have for forecasting a dangerous storm.—*Phila. Ledger.*

A Fearfully Destructive Tornado.

A tornado passed over portions of Winona and Dodge Counties, Minnesota, on the evening of August 21, that destroyed residences, elevators, public and other buildings, a railroad bridge, and a moving passenger train on the Rochester (Minn.) and Northern Division of the Chicago and Northwestern Railroad, the accident occurring near Zumbrota, Minn. The train, running at a high rate of speed, was caught in the wind storm and lifted from the track. Every car of the train was a complete wreck, and was almost literally shattered to pieces by the sudden stop caused by the train's leaving the rails, burying the unfortunate passengers beneath the debris, killing many, and injuring nearly every person on the train. The number of dead from passengers on this train has been estimated at not less than twenty, and of the injured eighty more. In Rochester, Minn., three hundred houses were demolished and two hundred more were damaged.

A Meteor in New York Bay.

On the evening of August 21, as one of the Staten Island ferryboats was approaching Governor's Island, a large white colored meteor shot across the horizon and burst with a loud report so close to Bedloe's Island that it seemed as if some of the matter—if there was any—of which the aerial missile was composed, must have landed amid the tree tops where the great statue will soon stand. Only the evening star was visible in the sky when the meteor appeared. One of the fleet of the Iron Steamboat Company was passing near Bedloe's Island at the time, and the three electric lights on board were easily compared in color with the low-reaching meteor. The latter looked much more clear and white, and gave the electric light a yellowish hue.

Something New in Street Cars.

On the Hamburg tramways a number of cars with flangeless wheels, much like omnibuses, and with turning gear, are working. To run on the lines, these cars are fitted with a shaft in front of the front wheels, this shaft carrying on a lever a disk wheel which the driver can lower into the tramrail groove as he requires, or raise it when it is necessary to get out of the way of obstructions. The arrangement works well, saves a lot of trouble, and the cars run easier than those with flanged wheels.

Correspondence.

The Storage of Wind Power.

To the Editor of the Scientific American:

I have been reading with interest the several articles published in your paper on the "Storage of Wind Power," have made several inventions in that line myself, and therefore beg leave also to offer my mite.

My idea of wind force is this: were the available energy of the wind that passes over the roof of a manufactory, through a space of 10 feet in height, utilized, it would be sufficient to run all the machinery therein, or, in other words, *the force of the wind is sufficient to run all machinery.*

Deep valleys are perhaps the only places where there is a scarcity of wind, and yet it would be an easy matter to transmit power from wind wheels on the adjoining hills. Here the All-wise Creator has also provided an auxiliary power, for where is there a valley without a stream?

But an accumulator is needed. Several days often pass without a strong breeze.

W. O. A. has certainly given some very practical hints, although the idea of dynamizing it into electricity can hardly be considered at present.

The compressed air plan, of the two, is the most feasible, but the great drawback is the cost of the plant.

I had thought of the plan suggested by Mr. Davis some time ago, but came to the conclusion that it is of no practical value.

For instance, take a manufactory 30 feet high. I would have to raise a weight of 355 T, approximately 360 T in practice, to this height, to accumulate one horse power for one working day (twelve hours).

It can readily be seen how much weight and space it would take to accumulate sixty or seventy horse power. This plan would also be very expensive. By substituting large steel springs for the weight, I could save space, and, I think, expense; this may be illustrated by clocks, etc. This plan seems practical. Some day I intend to give it a fair trial.

D. H. BAUSMAN.

Lancaster, Pa. August 17, 1883.

Fish Ponds for Farms.

A writer under the *nom de plume* of Norman, in the *Prairie Farmer*, gives its readers some practical information as to the construction of inexpensive fish ponds and how to stock them. We make the following extracts from the above source:

Having indicated the possibility of farms having a pond for fishes and enjoying a dish of sweet fish at times, we want to show how this can be done at little expense and labor. We stated in a previous letter, says the writer, that an acre of water can be made to produce more than an acre of land. A farmer writing to an Ohio paper says:

"We write from practical experience in this matter, having in earlier days caught many a nice string of fish in a pond that was formerly a swamp. During one day in August, the owner, with two of his boys, went in it with a plow, road scraper, and shovels, and in a short time had a pond of nearly an acre in extent. This he stocked with fish common to the sluggish streams of the neighborhood, and procured others at some distance from the farm. For years thereafter it proved to be the best acre on the farm."

While we do not advocate so cheaply made a pond as this, mainly on the principle that "that which costs nothing is of no value," still, this is better than no pond, and if a few trees and flowering shrubs are planted around it would make a pleasant, shady spot in the summer heat. If some aquatic plants are put in the bottom of the pond, they will furnish food for fish, and produce flowers on the surface. Your unsightly swamp or slough becomes a picture as well as a means of enjoyment and profit. Where springs exist, as described in my previous letter, some means must be provided to carry off the surplus water, especially if the lower portion of the pond is a deep ditch or slough. Let this be gradually shaped to an oval form, leaving about six feet wide to form your dam. If the head of your water will not exceed five feet, a simple dam and embankment of clayey earth will be sufficient. Let the dam be solidly constructed by putting a tree across for the breastwork. Square up this piece of timber, and let it be of sufficient length to be embedded into the earth some feet on each side of the ditch or dike. For the dam get good solid boards, set upright edge to edge. If hardwood planks can be obtained, elm or alder wood, so much the better will your dam be built. We should advise a bottom stringer to be put in; a tree squared up will form the best support. Inside this stringer dig a ditch two feet deep, and let the planks come to the bottom of this trench; puddle and ram them into position with clay and make a firm bottom. Build up an inclined slope of clay and stones. As you ascend, puddle and beat the clay into position against the planks. Get your road scrapers to work, and on this clay run up some of the mud and silt from the bottom of the pond. This all will give you a dam with a pond that will increase the value of your farm. A trough or sluice must be provided to carry off the surplus water. Experiments must govern you in its construction. A simple trough, a foot wide, four inches deep, will carry off a large quantity of water. Let the top of your dam around the wings be well rammed and beaten with clay, so as to prevent any leakage of water.

Into such a pond it will be necessary to put a few aquatic plants of such kind as will attract flies and larvæ, thus enabling young fish fry to obtain food in a natural state. Also plant willows near the dam. The roots will spread into the earth, binding it together, and also provide hiding places for the young fish.

Our readers will recall the fact that to successfully increase fish and keep them up to a good standard in size, we must provide proper food for them. We do this by putting in minnows and fish of such kinds as are prolific, yet of small value as food fishes. These in turn will "form food for fishes." To feed these minnows we put in aquatic plants that attract insects. We will name a few that are common: Potamogeton, Myriophyllum (water millfoil), Utricularia (bladder wort), common water lily, Polygonum, Amphibium, Pennsylvanicum, Nasturtium officinale (water cress), Zizania aquatica (water oats, or Indian rice), Sagittaria (arrowhead), a fine calla-like growing plant.

If we wish to introduce some insect life in our pond, we examine the weeds pulled from the bottom of some neighboring lake or stream, and find them teeming with minute creatures. Let us watch the minnows and small fry around these weeds! How carefully they nose around them, pushing the leaves aside. These minnows live on these infusoria. Pull a bucketful of the weeds, carry them to your pond, lay the roots on the soft mud, put a stone across the roots, and you will find the weeds soon growing. The few minnows we have put in have found the weeds and are getting a feast. Your minnows will increase and multiply. Get some yellow perch, a few pickerel, and half a dozen small bass. We cannot commend the sun fish, simply because he is a cheeky gormand, snapping up everything that comes across his way, having a decided fondness for spawn of all kinds. There are better fish to be had, but he has one advantage to commend him—he will live in almost any water.

The best table fishes for ponds having springs in them are the bass, the yellow perch, and pickerel; put in a few bullheads or pouts; they are good food fry.

Many farms in these times have a windmill on them for furnishing water for stock, and supplying the house from the well instead of the laborious pumping by hand. By all means lay on a pipe to the fish pond. It will pay. The fish named will live in water pumped from the well even though impregnated somewhat with sulphur or iron. Perhaps the soil on a farm may be gravelly, and not bearing soil in which the small blood red worms are found; such soil needs "stocking." From some stream or lake we dip up a paddle full of mud. A careful examination proves it to be full of minute worms and other forms of infusorial life. Deposit some of this mud in your pond, and you have also food for another class of fry. Let us follow nature in her plan. Her courses are simple, few, and generally direct. She adopts a means to an end, and varies little in her aims.

It is useless to attempt to stock a pond with trout, because these love the dashing, seething brook. It is useless to put the carp in a pond with the bass family, because the latter are a carnivorous family, and must live on fish fry. The carp must be bred in ponds especially prepared for them, and after breeding must be kept separate from the young fry.

Finally, keep your pond clean. Do not make it a place for the cattle to wade in and drop their excrements. In time, put a fence around it. Plant some species of pines near to it. A few maples or rock elms will add to its beauty and afford a graceful shade. Plant some willows along its sides close to the water. These, overhanging, will afford the fish a shadow from the sun's rays, and their roots will make a good spawning bed; though a proper bed should be made in season and left in the water. A mat of brush fastened in a framework of wood, and sunk to the bottom, forms a good spawning bed for members of the perch family.

Let some attention be given every spring and fall to your pond. Repair all damages. Look to your "finny stock," sometimes feed with carcasses that are the "results of accidents" on every farm. Let this be done in nature's own way. Drive a stake into a pond to fasten such things to, and in a few hours the swarms of fish in your pond are looking for maggots, of which they are very fond.

Let me counsel in conclusion: Never allow a net to be cast in your pond. Teach your boys and girls to take their fish in the correct manner "with rod and line." If the fish increase too rapidly, then have a family picnic; invite your friends and neighbors, and have a grand, good time cooking your fish near the pond, and have one good day's sport beside this best acre on your farm.

Effects Produced by High Pressures.

M. Friedel, having contested the announcement of M. Spring that a pressure of 5,000 atmospheres exerted upon amorphous pulverulent matters causes them to become aggregated into crystalline masses, MM. E. Jannettaz, Neel, and Clermont determined to repeat his experiments, using pressures of from 6,000 to 8,000 atmospheres. They operated upon pulverized antimony, bismuth, zinc, iron, tin, copper, and lead, Darcet's alloy and brass, lead, and zinc sulphides, sodium lead and mercurous chlorides, mercuric iodide, magnesia, alumina, silica, chalk, and copper sulphate. All these powders were agglutinated into solid masses, but even those which acquired some degree of transparency were not crystallized. Many of the substances, however, such as steatite, graphite, clays, and metals, acquired a schistous structure, and assumed the thermic properties characteristic of such structure.

Locusts.

The districts of Matheran and Mahableshwar, in the Bombay Presidency, according to *The Colonies and India*, have been suffering from an invasion of locusts, huge swarms of which have settled on the trees, which appear to be covered with red foliage and clusters of red flowers during the occupation, but when abandoned are nothing but bundles of bare twigs. While the locusts are on the wing, it is difficult to make any impression on them, although an Italian landowner, resident in Cyprus, has destroyed vast numbers by placing in their path, soon after they are hatched and still unprovided with wings, pits so prepared that, after tumbling in, it was impossible for them to get out. This, however, is only feasible during the wingless stage, when the young locusts march across the country in great columns, more than a mile in breadth.

But the most radical treatment is that of destroying the eggs, which, fortunately, are deposited, not single, but in masses in one place, generally on an uncultivated hill side. The female inserts the eggs by means of a sword-like appendage, and sheds a glutinous matter for their protection; and, as traces of this may be seen glistening on the surface of the soil, it affords an easy clew for the searcher to discover their whereabouts. In Cyprus rewards have been offered and taxes imposed with a view to stimulating the peasantry to destroying the eggs, 62 tons of which were brought in during 1868, representing 50,000,000,000 locusts, the result being that the pest disappeared for several years.

Enormous as is the destruction caused by the locust, there is one advantage about it, viz., that it is edible, in Arabia men and horses using it regularly as an article of diet. By some of the natives they are eaten with oil after being stripped of their legs and wings, but Lady Anne Blunt, in her travels, was in the habit of boiling them and dipping them in salt. Their flavor is described as savoring of a vegetable, not unlike the taste of green wheat.

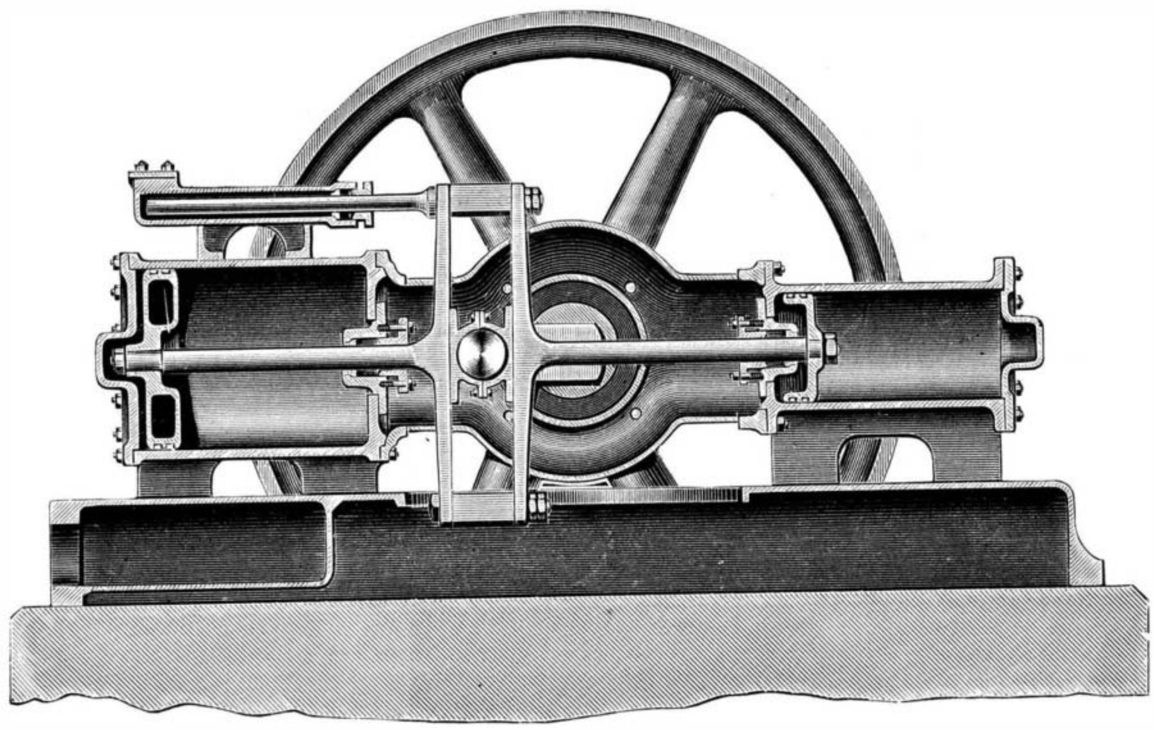
An Interesting Experiment.

In a legal case the point in dispute was whether the water in a brewery well was being polluted by the infiltration of water from a neighboring well about 100 yards distant. The constituents of the waters derived from each well did not differ sufficiently for an opinion to be formed on the point in dispute, simply by comparing the analyses of the two waters, and therefore it was ingeniously suggested, says the *Brewers' Gazette*, that some soluble salt of rare occurrence should be placed in the well suspected of causing the pollution, and then the water in the brewery well should be subsequently tested to see whether traces of this salt had passed from one well to the other. Chloride of lithium was the salt chosen for the experiments, as it is of comparatively rare occurrence, and is very easily detected by the marked crimson color it imparts to a flame, and the minutest trace can be detected by the aid of the spectroscope. Shortly after having placed some of this salt in the well suspected of causing the pollution, the brewery well water gave undoubted indications of lithium being present, and the experiment thus proved that water readily passed from one well to the other, and the dispute was easily settled.

The Grocer, London, predicts that Russian petroleum will gradually prove a formidable rival to American oil in the German market, especially the eastern provinces. Several reservoir cars, it says, have recently arrived at Bromberg direct from Baku, delivering their cargo at a price lower than American petroleum via Bremen, and of the same quality.

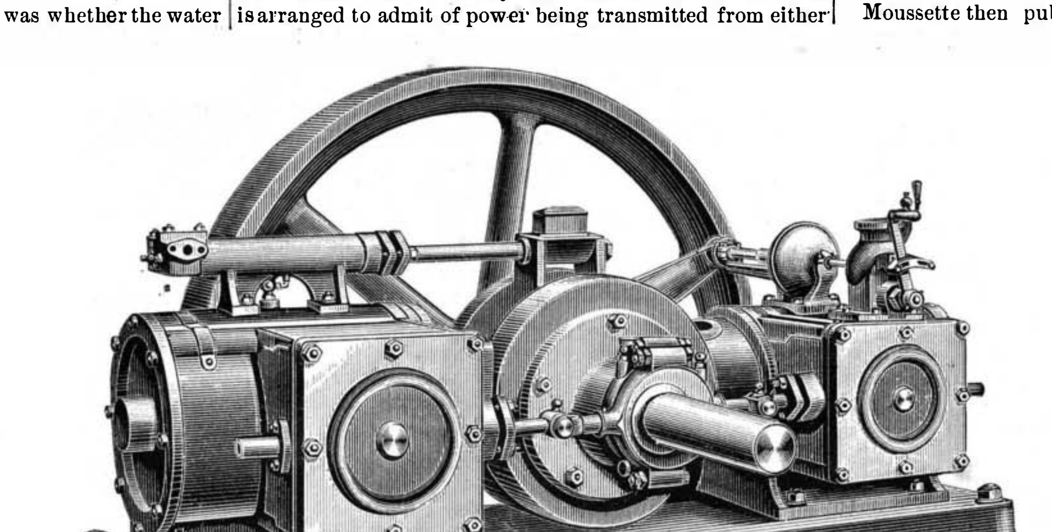
COMPOUND DOUBLE ACTING HORIZONTAL ENGINE.

We illustrate a 12 horse power horizontal engine upon this principle, and which was exhibited by Messrs. Shanks and Son, the builders, at the Engineering and Metal Trades Exhibition, London. In our engravings, Fig. 1 represents a perspective view of the engine, and Fig. 2 a longitudinal section. The chief features of this engine consist in the compactness and rigidity of its design, and the small number of its working parts; while, at the same time, the engine is found to be as complete and effective as the most elaborate type of compound engine. It will be seen that the two pistons are connected together by a wrought iron crosshead having in its center a vertical slot, into which the crank pin bush is made to slide the same length as the stroke of the pistons, the double stroke completing the revolution of the crank shaft in the usual way. The motion of the pistons is thus communicated direct to the crank shaft without the intervention of the connecting rod, motion bars, slide blocks, etc., usually required for this purpose, and all friction arising from their use is thus avoided.



COMPOUND DOUBLE-ACTING STEAM ENGINE.

The arrangement of the working parts is clearly shown at Fig. 2 of our engravings, and by means of this the whole construction will be readily understood. The crank shaft is arranged to admit of power being transmitted from either side of the engine. These engines require no intermediate receiver, which is indispensable in ordinary engines of this class. The advantage of a continuous expansion is therefore secured without compression or back pressure, and a material increase in the effective power of the engine is the result. The proportions of the cylinders are such as to enable either high or moderate steam pressure to be used with effect. These engines are equally well adapted for agricultural and commercial purposes or for driving dynamo machines for electric lighting, being fitted with Shanks' equilibrium governor, which is peculiarly sensitive, a quality essential to the satisfactory working of engines used for driving dynamo machines. In some examples of this engine a condenser is attached the condenser being placed below the engine and forming part of the sole plate.—*Iron.*



COMPOUND DOUBLE-ACTING STEAM ENGINE.

Fermentation in Bread.

Chicandard's paper on this subject, referred to in the SCIENTIFIC AMERICAN, of August 18, has drawn forth papers from other members of the Academy. V. Marcano publishes similar results (*Comptes Rend.* 96, 1733). He found, however, that the fermentation process depended upon local circumstances ; thus he obtained different results in Venezuela, in the tropics, from what he got by repeating his experiments in Paris. He never noticed yeast fungi, but always saw an abundance of moving globular bacteria, and that, in the process of bread making, the gluten and a portion of the albumen was partially dissolved, and converted into peptones that are not precipitated by tannin. Also that "amylase," a secretion of the microbes, was formed. These results agree with those of Chicandard. But while the latter did not observe the dissolving of the starch, Marcano found in his Venezuela experiments that the dough at the beginning of the fermentation contained a mixture of much "erythro" dextrine with but little soluble starch; as soon as it was put into the bake oven, it contained a perceptible quantity of "achro" dextrine. These substances could be isolated.

Hence bread making is an example of the direct fermentation of starch. In Venezuela, if sugar is mixed with the flour, which makes the dough poor in gluten, it is easy to prove that the bacteria do not attack the starch until the albumen is exhausted. From this it will be seen that there is an actual and direct fermentation of the starch, while it explains the necessity that people there are under of employing ferments that are very strongly developed by Indian corn, potatoes, cane sugar, etc., to get a dough that rises well. In Paris he did not succeed in observing the direct fermention of starch; it remained perfectly intact.

Moussette then published (*Comptes Rend.* 96, p. 1865) an account of experiments made by him in 1854, when he was assistant to Barral, in condensing the vapors that came out of a bake oven while bread was being baked.

He obtained a liter of liquid from which he was able to distill off 1·6 per cent, by volume, of *alcohol*, and 0·06 per cent of acetic acid, by weight. Will not some American repeat this experiment?

Naval Power of France and England.

A comparison of the British with the French fleet shows that each contains just thirty-six first-class war vessels. In point of thickness of armor and weight of guns, two of the English are superior in offensive power to any on the French list. But in the next seventeen on each list the French are superior to the English, and in the whole list the French are superior in twenty four, the English only in twelve. Besides this, the English discarded breech-loading cannons in the construction of their fleet, on the ground that muzzle-loaders are easier to manage at sea. The French and the other Continental powers adopted the breech-loaders, which are capable of swifter and more effective handling. Taking the two navies throughout, it appears that England is far from possessing that pre-eminence on the sea, a contemporary adds, which she did in the days when her "wooden walls" were her glory and her defence. Even Italy and Germany now might challenge comparison with her.

MOSQUITOES are accused by Prof. A. F. A. King of originating and disseminating malarial disease.