overmatched in guns and armor at all ranges her only choice is to run." That is true, but what he ought to have said—what it is infinitely more important to observe—is that if she is overmatched in speed her only choice is to let the enemy run away, no matter what guns or armor she may carry. And if she is overmatched in speed and guns her only choice is to surrender (or sink), no matter what armor she may carry. For, as Mr. Cardullo shows clearly, the thickest possible armor can be penetrated by the 12-inch gun at any fighting range.

Every American designer of battleships ought to hang up two mottoes in his workshop: "Remember the 'Essex'!" "Remember Farragut!" For the "Essex" was captured at Valparaiso because she did not have enough motive power to enable her to get within range of the "Phoebe." If we are to remove the eagle from our shield and put the porcupine or the terrapin in its place—if we are to wait for the enemy to come to our harbors to do the fighting, and when there to choose his time of fighting and his range—then speed is of less importance than armor. But the men in our navy who can be trusted to defend our country by forcing the fighting, are a unit in demanding ships that will have, first of all, power to reach the fighting line in spite of the enemy's modesty; and when there will have guns to demonstrate the truth of the immortal words of Farragut: "The best protection against the enemy's fire is a well-directed fire from our own guns." John R. Spears.

Northwood, N. Y., February 16, 1907.

The Scientific American in Syria.

To the Editor of the Scientific American:

It is becoming better known among scholars, that to the Arabs and to the Arabic language modern learning and modern civilization owe a great debt, not only because of the direct contributions of the Arabs to the sciences of mathematics, chemistry, astronomy, and metallurgy, but also because they saved for us and transmitted to us so much of the learning of the ancient Greek civilization. There was a time when the "glimmering light of knowledge was all but ready to die out," and would have done so but for the Arabs. Many of the noblest scientific works of antiquity had disappeared from the languages in which they had been written, and were saved to us through the Arabic. It was thus that the works of Plato and Aristotle and Euclid traveled by way of Bagdad, Bassora, Sicily, Cordova, and Seville into Europe.

Now I am sure that your readers will be interested to learn that you in your publications have for years been making a return in the nature of a partial payment of the debt we owe the Arabs, which has come about in this way: For more than forty years the American Presbyterian Mission in Syria has published a newspaper in the Arabic language called the Weekly Neshera, which circulates well over the Arabic-speaking world. It has always been an aim to give to its readers the latest and most accurate accounts of all discoveries in science, together with a record of the yearly advance of learning. We have found nothing to equal the Scientific American for this purpose, so that as a result it is well within the facts to say that during the forty years there have been translated from its pages into the Arabic as many as two thousand articles and paragraphs. In recent years the Arabic newspapers in Beirut alone have increased to as many as twenty, and these in turn copy most of the scientific articles, and give them a still wider circulation among Arabic readers. Franklin E. Hoskins.

Beirut, Syria, January, 1907.

Sweet Milk and Indigestion.

To the Editor of the Scientific American:

In a recent issue of the Scientific American I find an article concerning sweet milk, and I also find municipalities making war on dairymen, directly and indirectly accusing them of selling unclean milk.

In this connection, being myself a specialist in the treatment of indigestion, I would like to make known to the people and scientists through the Scientific American just what I have discovered in regard to sweet milk.

I find that thousands of people who are well and hearty seldom, if ever, drink sweet milk, whereas the majority of those who are sick, ailing, or chronic invalids drink it, many to an excess, and as a rule those who are the most ill drink the most milk. I also find in treating stomach trouble of years' standing that they cannot be cured unless sweet milk is withheld from the diet, but that they can be permanently relieved in a very few days if it is withheld. I do not wish to be understood, however, that abstaining from milk will cure chronic indigestion, but when sweet milk is used, the cure is apparently impossible.

One instance: A patient was sick for years with what is known as dyspepsia and prolapsus in its worst form. Former physicians gave her largely a diet of sweet milk, but she received no benefit for either complaint. On beginning my treatment, I had her abstain entirely from sweet milk, not even taking cream in coffee, and in a fortnight she had recovered from nearly all ill effects of indigestion, and possessed the ability to digest three hearty meals per day, and was soon entirely well of both complaints.

Just why sweet milk has this effect in stomach trouble I cannot say, but would like to find out.

Yet I know a great many physicians prescribe a sweet-milk diet in treating dyspepsia and other chronic ailments. Clay Harpold.

Cleburne, Texas, January 18, 1907.

The West Indian Hurricane.

To the Editor of the Scientific American:

I note with interest Mr. Wilmoth's article in your issue of December 22, stating that the injury to timber, crops, and shipping in the West Indian hurricane of September 26 and 27 was due, not to the storm so interestingly described in your issue of November 24, but to another storm which blew in an opposite direction, i. e., northwest, as shown by the thousands of trees broken, all of which point to the southeast.

Mr. Wilmoth assumes that there were two storms, one from southeast to northwest (as stated in your article), the other from northwest to southeast, the edges of the two storms meeting or overlapping near the eastern boundary of Mississippi.

This phenomenon, which Mr. Wilmoth believes to be very rare, results from the well-known whirling of winds about a cyclonic center, the motion of the wind in a hurricane being closely analogous to the movement of water discharging itself by a vent at the bottom of a basin. If the water be given a slightly rotary motion before the vent is opened, the threads of liquid, instead of moving radially inward, will be deflected so as to form a rapidly whirling eddy or vortex of increasing velocity toward the center. The centrifugal force developed by the rapid whirling of the water on a small radius produces a distinct depression on the water surface at the center, and may become so great as to open an empty core.

In the foregoing, the top of the water represents the bottom of the atmosphere; the downward discharge of water corresponding to the convectional ascent of the air, and the whirling escape of the water representing the whirling inflow of winds, moving gently at first, but increasing in velocity as the center is approached until a hurricane violence is attained, close to the central area of dead calm.

Because of deflection, due to the earth's rotation, these cyclonic winds move spirally inward toward the area of least pressure—in this hemisphere, in a direction counter to the motion of the hands of a watch; from which it is evident that the direction of the wind, at any point in a cyclonic system, depends entirely on the position of the observer with reference to the center of the storm.

If his position lies on the center of the storm track, he will note first a gentle southeasterly wind, gradually increasing in velocity and shifting somewhat to the south; the thermometer falling, temperature rising, and cloudiness turning to rain or snow. On the approach of the central area of least pressure, the velocity of the wind becomes excessive, and the centrifugal force increases at a rapid rate; then follows a period of comparative calm, the air being held away from the storm center by the excessive centrifugal force. Shortly after, the wind veers more or less suddenly to the northwest, increasing to hurricane violence as the barometer rises and the temperature falls. This sudden reversal of the winds is due entirely to the storm's progression, which brings the observer successively under different parts of the spiral whirl.

If Mr. Wilmoth will keep the above in mind, he will have no difficulty in identifying his two overlapping storms as integral parts of the hurricane of September 26 and 27, described in your issue of November 24.

Chicago, Ill. David J. Block.

THE MOTOR BOAT SHOW AT MADISON SQUARE GARDEN.

BY A. E. POTTER.

The First Annual Motor Boat Show, divorced as it was from the Sportsman's Show, which has come to be one of the fixtures of the late winter, closed last Tuesday night after a remarkably successful run of seven days and nights at Madison Square Garden, New York city. The Fourteenth Annual Sportsman's Show opened last Friday and will last until Saturday.

On entering the Garden, one was at once struck by the changed conditions. Rustic bridges and hand rails and decorations of firs were not in evidence, nor was there the tank that had been seen for two seasons previously. There was present, however, an air of business that assured success from the outset. Very little had been spent for decorations, fancy signs, etc., but there were numerous boats, engines, and accessories exhibited. Although many of the exhibits were meritorious, the Show was hardly representative of the industry, as many prominent and favorably known builders were absent.

The West was largely represented by both hulls and engines. New York and nearby motor-boat and engine builders were fairly numerous, while New England furnished but four or five exhibitors of either engines or boats.

The high development of the boat builder's art was reflected in a number of fine creations contributed by several well-known firms. These beautiful craft, finished in the natural wood and polished like mirrors, were carefully and critically examined and inspected.

The Michigan Boat Company and Detroit Engine Works, of Detroit, Mich., exhibited a line of boats at such low prices as to bewilder one who was familiar with the cost of construction of such craft, when laboriously contrived without the aid of up-to-date woodworking machinery and modern manufacturing methods. Their exhibit of knockdown frames was the only one of the kind in the Show, as was their power canoe. They also had on exhibition a knockdown frame assembled ready for planking. Their steel boats were also interesting and showed considerable development in this type of hull.

The Mullins Boat Company, of Salem, Ohio, had an unusually large line of their famous pressed-steel boats on exhibition. The one which attracted the most attention was a 35-foot by 7-foot day launch with torpedo stern, protected propeller, three-armed shaft strut, and balanced rudder. The six-cylinder engine was placed under a hood at the bow with the entire control attachments on the bulkhead, which divided the engine compartment from the commodious and well-arranged quarters amidship and aft. The steel used in this boat was No. 12 gage, smooth seamed, galvanized, and carefully riveted and soldered. The skin of the boat was not attached to her strong, bent, oak frames. The method of fastening the sides was novel and betokened great strength. The keel was of oak, to the bottom of which was bolted a heavy T iron. The sides were extended and riveted through the lower extension.

Mention should be made of the Atlantic Company's exhibit. These boats were built at Amesbury, Mass., and were remarkable for their apparent seaworthiness. Two were dories, while the third was a 23-foot open boat with canoe stern and dory bow. The dory may not strike the fancy of power boatmen all over the world, but in New England, where its value is appreciated from its utility and safety, its appearance meets with popular approval, and the use of the power dory is extending surely and rapidly.

The Williams-Whittelsey Company, of Steinway, L. I., showed an interesting collection of complete models, built to scale. This is the first time that models have been put on exhibition by motor-boat constructors. Two of the boats shown in this way were new ones now under construction, while the other two were boats already in existence, one of them being the U. S. coast defense inspection boat "Norka," which was illustrated in our Motor Boat number.

Among the interesting engines of the two-cycle type were noted several that showed considerable ingenuity in their design and construction. One of these, for example, was a 4-cylinder double-acting, vertical engine having explosion chambers at each end of the cylinders and compression chambers between. This motor was an extremely smooth-running and light affair. Still another interesting two-cycle motor was one in which a positively-actuated inlet valve was used for the introduction of the charge into the cylinder.

The exhibitor occupying the most space was the Truscott Boat Company, which had the entire eastern end of the Garden. This company showed its usual superior line of boats, and a decided novelty in engine construction. This was of the four-cycle type, with cam shaft mounted on top of the cylinders, driven by sprockets and a noiseless chain passing up inside the casting between the cylinders, which were cast in pairs. The cylinders had dome heads cast integral. The valves were of the removable cage type, and were operated by rocker arms. Some of the claims of this construction were extreme accessibility and conservation of power by reducing the loss from radiation to the minimum.

Another extremely interesting engine was the five-cylinder, air-starting Dock engine of 30 horse-power, now being built by the New York Safety Steam Power Company, of this city. In the accompanying illustration, which shows the inlet side of the engine, may be noted the air compressor and controller on the front. A reducing valve in the air-supply pipe is interposed between the air-storage tank and the fitting *I*, between the carbureter, *C*, and check valve, *V*. To start the engine air enters the fitting, *I*, passes through the carbureter, *C*, the check valve, *V*, preventing its escape, and enters the cylinders only when gas is taken into them in the usual cycle, that is, at each alternate down stroke of the piston. This is accomplished by means of a novel arrangement of the inlet valve here shown. There is a cylindrical bushing held in place normally by the inlet valve spring. This bushing has a sectional area greater than that of the valve head. When the air under pressure passes through the carbureter, it takes up its quota of gasoline vapor and enters the cylinders in the form of the usual explosive mixture. As it enters the valve chest the pressure bears on the balanced piston or bushing, forcing it down the valve stem until it engages the retaining nut. This securely seats the valve, and prevents the entry of any gas until needed. When the cams on the lay or two-to-one shaft open the inlet valve, the balanced piston and valve move together.

This engine has been used two seasons and has done excellent service. It has been found extremely economical in air used for starting. The engine is a marvel of simplicity as to its air-starting arrangements.

The Art Machine Company, of Brooklyn, N. Y., had two exhibits. On the main floor were seen sectional and full models of the Fulton engine, celebrated two years ago by being selected as the motive power in the widely known Knickerbocker Yacht Club one-design power-boat class, or "Sea Skunks." One of these craft was shown complete in every detail, reduced to one-quarter size.

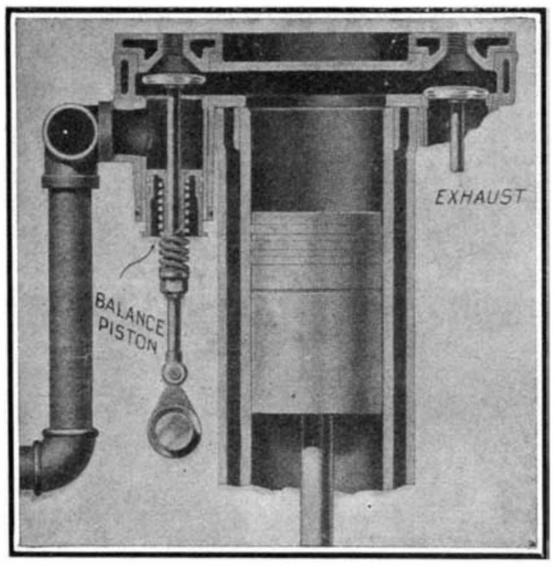
In the gallery was shown an economical electric soldering iron, connected with an ammeter and voltmeter. It showed a consumption quite remarkable. An iron equivalent to a 4-pound regular copper took 2⅛ amperes of a 116-volt current, while a larger size, equivalent to a 6-pound copper, took but ⅛ ampere more.

Showing that heavy-duty engines are in demand, the Buffalo Gasolene Motor Company, which has heretofore built only high-speed engines, has placed on the market a line of their slow-speed heavy-duty machines, one of which was exhibited.

Altogether, there were three high-powered engines exhibited. One was the 300-horse-power, double-acting "Standard," which, together with the boat that it drove last autumn a mile in record time, was illustrated in the Motor Boat number.

Another was a 250-horse-power engine, built by James Craig, Jr., of this city. This is the type of engine used in Holland submarines, such use necessitating a light, strong engine. The third was the 150-horse-power "Speedway," manufactured by the Gas Engine and Power Co. and Chas. L. Seabury & Co., Consolidated.

One of our illustrations shows this engine. It is of the usual four-cycle type and is made up of six cylinders, having an 8½-inch bore by 10-inch stroke. Its power rating is at 550 R. P. M., and it is capable of being speeded up somewhat, and developing still more power for high-speed work. The valve arrangement is similar to that used heretofore. In addition to the high-tension ignition system (the current for which is supplied from a storage battery and a small dynamo that charges the same), low-tension magneto ignition is also fitted. The make-and-break igniters are seen in the valve chambers of the six cylinders. They are operated by rods extending downward to a special igniter cam shaft, which is placed beside the usual half-speed cam shaft and driven from it by gears. The mechanism is such as to give a very quick break at the igniters. A Sims-Bosch low-tension magneto is driven from the ignition cam shaft, and hence its armature is always kept in the proper relation with the breaking point of the igniters. The engine is provided with a governor, which closes the throttle and keeps the engine from racing when the clutch is thrown out. The cylinders and wrist pins are lubricated by a force-feed oiler, and the main bearings and crank pins by a gravity-feed oiler. The crank pins are furnished with centrifugal oil rings. The cylinders are mounted upon cast box-shaped sections, each of which is bolted to the bed plate of the engine. The engine is cooled by water circulated through the cylinder jackets by means of a gear-driven gear pump. The water first passes through the cylinder jackets, entering on the exhaust side; it then passes through outside connections leading from the upper part of the cylinder jacket to the cylinder heads (which are removable), and finally passes around the water-jacketed exhaust pipe. The engine is started by means of compressed air, which is let into three of the cylinders. The air is obtained under pressure by means of a small compressor driven by the engine. It is stored in a small reservoir under a pressure of 60 pounds to the square inch. The carbureter is located above the engine in an accessible position. It is of the overflow type, being supplied by a small plunger pump worked by the engine. The inlet pipe and the carbureter are heated by the exhaust gases of



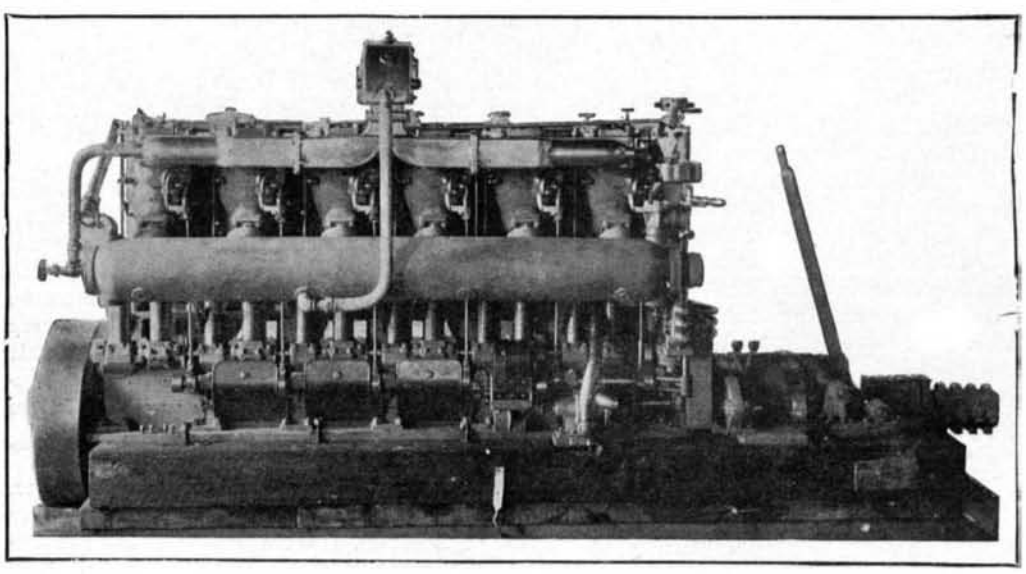
Cylinder of Dock Engine, Showing Inlet Valve Carried in a Balanced Piston.

the engine, which pass through suitable jackets around them.

The Holmes 25-horse-power four-cylinder four-cycle auto marine engine, built by the Holmes Motor Company, of West Mystic, Conn., attracted considerable favorable comment. This is the engine that stood the severe test at the hands of the U. S. life saving service officials recently, on Lake Michigan. It is an especially get-at-able engine, and has made a record for facility and speed in assembling and disassembling.

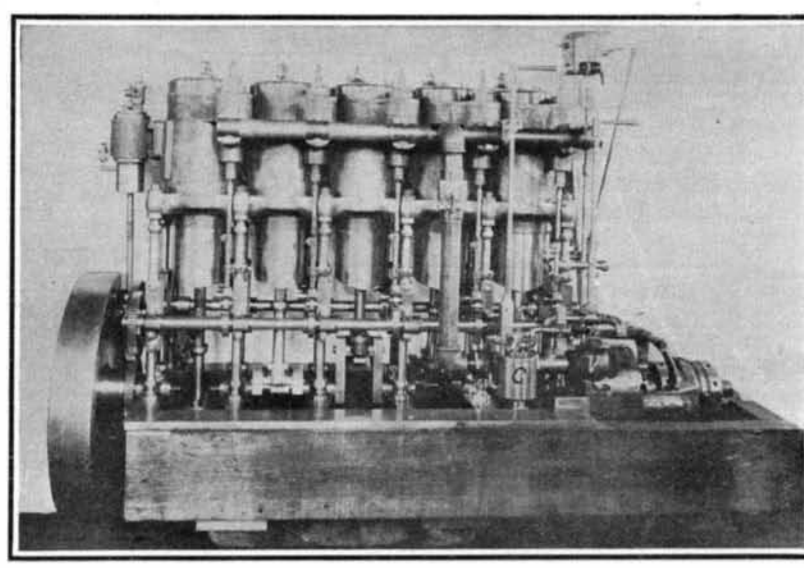
The attendance during the show was good. There was not present the morbidly curious crowd which has been in evidence in previous years, and the attention of would-be purchasers has not been continually diverted by aquatic and other scheduled events.

Another year it is hoped that uniformity of decorations and signs will be followed and that the spaces will be more evenly divided, which will be necessitated, provided many, who should exhibit, decide to take part in next year's Show.



Exhaust Side of the 6-Cylinder, 150-Horse-Power Speedway Marine Engine.

Cylinder bore and stroke, 8½ x 10. Normal speed, 550 R. P. M. The special features of this engine are the separate igniter camshaft and the water jacketed exhaust.



Inlet Side of the 5-Cylinder Dock Marine Engine.

Cylinder bore and stroke, 5 x 8. Normal speed, 450 R. P. M. This engine has a special air starting device of great simplicity.

NOVEL MARINE GASOLINE ENGINES ON EXHIBITION AT THE MOTOR BOAT SHOW.

WRECK OF AN ELECTRIC TRAIN ON THE NEW YORK CENTRAL.

In addition to the sympathy which we feel for those who suffered in the recent derailment wreck on the New York Central Railroad, when twenty-three persons lost their lives and a large number received more or less injury, every one who is not blinded by prejudice must also feel sympathy for the railroad company that the inauguration of their costly and most excellent system of electric operation should have been darkened by this terrible tragedy. It is not for us to prejudge the case, but it certainly does seem that the worst that can be said against the management is that they failed to realize that even their splendid roadbed, whose reputation is known the world over, required some further adjustment to meet the heavier stresses incidental to the operation of electric locomotives. If our foresight were always as clear as our hindsight, accidents of this character would never happen. We believe that, as a body, engineers of the high professional training of those employed by our leading railroads are marked by great zeal and thorough conscientiousness in their work. But the history of engineering shows that when new problems are presented, it is seldom that the analysis of conditions grasps every new element and makes adequate provision therefor.

To take the case in point, the curve on which the accident occurred was an easy one, being of only three degrees variation from a tangent in every 100 feet of length. It called for a 4½-inch elevation of the outside rail, and under these conditions the centrifugal force would be about balanced on a train running at the speed of 46 miles an hour. At speeds above this the train would crowd against the outside rail with a pressure which would increase as the square of the velocity, and in the judgment of the engineers this speed could be run up to as high as 65 miles an hour without endangering the train. This, they claim, is the general railroad practice throughout the country. Now the reason that steam railroad tracks are not elevated for the highest speed is that slow trains are sometimes run over express tracks, and it is considered that the best compromise is to elevate the outside rails for the mean speed.

The elevation of the outer rail above the inside rail is done in obedience to Newton's first law of motion, according to which a body will continue in its state of uniform motion in a straight line unless compelled to alter that state by force impressed upon it. Thus, when a train enters a curve, its tendency under this law is to continue to run in a straight line, and the "force impressed upon it" is represented by the reaction of the outside rail of the curve, which thrusts the train laterally from the straight line, with a pressure which increases directly in proportion to the weight of the train, in the inverse proportion to the radius of the curve, and directly as the square of the velocity with which the train is moving. This product of the weight, speed, and curvature is known as the centrifugal force; and when a train is running on a curve which has no elevation of the outer rail, a point is soon reached at which the resultant of the weight of the train acting vertically and the centrifugal force acting horizontally, will pass outside of the outer rail and result in the overturning of the train, or the climbing of the wheels over the track, a condition which is represented in one of the accompanying engravings. In order to counteract the lateral centrifugal effect, the outer rail is elevated and the car tilted toward the inside of the curve. If this elevation is of just the right amount for the sharpness of the curve and the speed of the train, the resultant of the weight and the centrifugal force will lie in a direction normal to the track, and the train will have no disposition to bear against either the outer rail or the inner rail. If the elevation is too small for the speed and curvature, the train will bear against the outer rail, and if the elevation is too great, the train will tend to bear against the inner rail.

Now, since the accidents due to jumping the track or the spreading of the rails always occur on the outer rails, it is evident that it would be better to have an excess of elevation rather than otherwise, thus relieving the outer rail, even when the fastest expresses are running around the curve, and permitting the slower trains to run against the inner rail, against which there is but slight risk of derailment. It is true that because of the action of the coning of the wheels, the resistance of the slower trains may be somewhat increased by this arrangement; but the increase would not be sufficient to counteract the enormous advantage derived from having an absolutely safe-riding track.

In the case of the accident on the New York Central, an inspection of the curve on the morning after the accident, when the track had been once more put in shape, showed that the spikes on the outside of the