The Grand Central Station.

This great headquarters and metropolitan station of the New York Central and Hudson River system is now being enlarged and changed as to its exterior in a most radical way, although the interior arrangement of the ground floor is not to be changed at present. The original building, not counting the more recently added train-receiving house, was 240 feet on Forty-second Street by 692 feet on Vanderbilt Avenue, built of brick, stone and iron, and costing nearly $2,250,000. On the streets named it was three stories high and was surmounted by several Louvre domes, and three more stories are now to be added, giving a uniform height of six stories, the towers also to be carried up proportionately, except the clock tower, which is to be obliterated. The entire building will be faced with stucco work, giving it the appearance of Indiana limestone, and the improvement will cost in the neighborhood of $700,000. The added room thus provided has long been needed for the use of the executive officers and the 500 to 600 clerks employed. It may be added that at the same time that this very considerable work is being carried on, employing a large force of men, the neighboring streets are also being occupied by the workmen and materials necessary in constructing the new underground trolley, by which many of our leading street railways are to be operated by electricity.

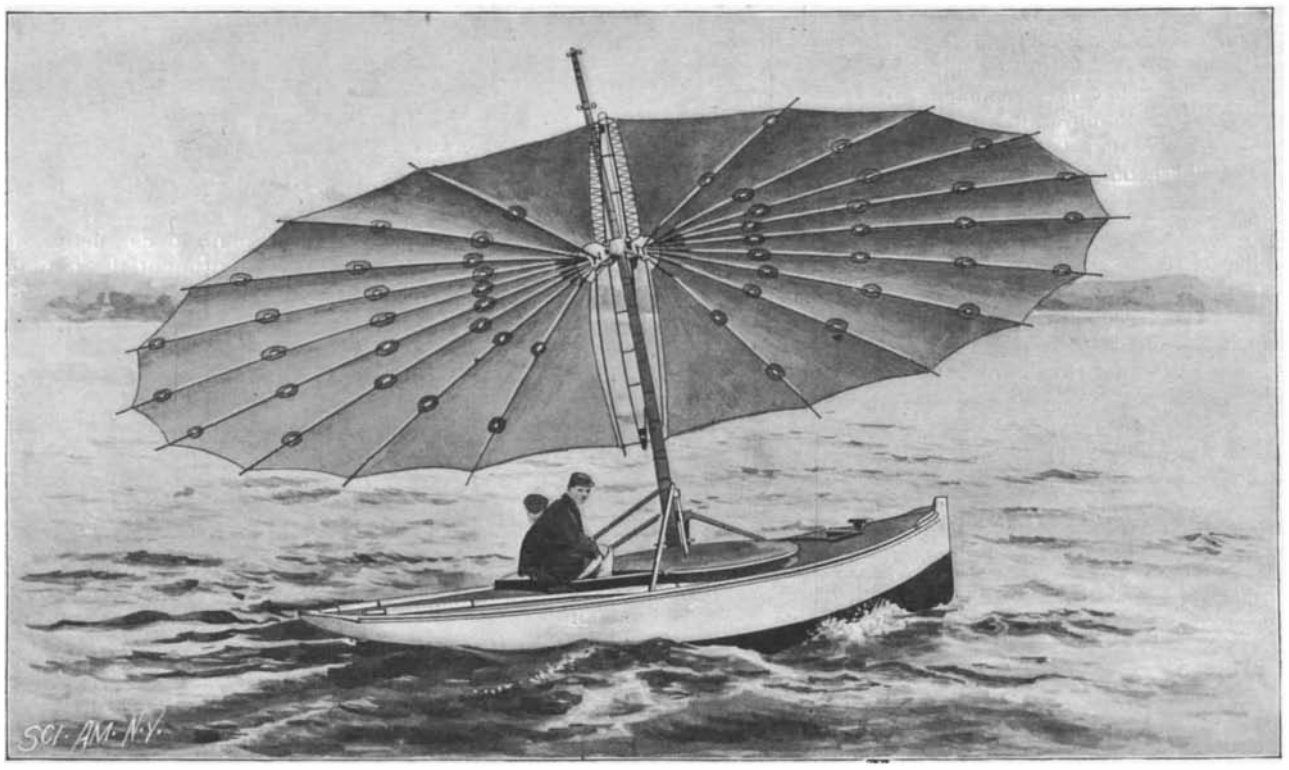
THE UMBRELLA BOAT.

The queer sailing vessel shown in our engraving is called the "umbrella boat," and is also known as the boat with the cyclone sail. This boat has been very conspicuous at Cowes and in the Solent. Our engraving was made from a photograph by West & Sons, Southsea, Eng. The chief feature of the cyclone sail is, it is said, that "the wind pressure does not tend to incline the boat. When the wind is making a large angle with the sail the center of pressure is almost at the center of the surface, but when the wind strikes the sail at an acute angle, as in all sails or kites, the center of pressure moves toward the weather edge; but, by suitably adjusting the sail, the desirable result of obliterating all heeling movement has been achieved.

"In practice this has been obtained by putting more sail to leeward than to windward of the mast and also by placing the sail not quite at right angles to the mast, but more raised on the lee side. The sail is made oval, with the major axis horizontal, so as to be able to carry more sail with a definite height of mast.

"The training in a horizontal direction is accomplished by means of a turntable, and the elevating and lowering by two tackles. There is a balance weight which helps in elevating the mast and which is just sufficient to balance the dead weight of sail in a calm not inclining the boat. The sail can be set and furled in a minute; it does not close like an umbrella, but each side shuts up like a fan. The object of the sail is to be able to sail without inclining the boat, so that the limit of driving force is not governed by the stability of the boat in any way, and also that the boat sailing on an even keel has less resistance than when sailing with a list."

In addition to the inventor's claim for his boat, the following particulars may be of interest: The sail in the illustration measures 30 feet horizontally and 16 feet up and down, while the total length of the boat is only 17 feet on the water line. With an ordinary rig 200 square feet of canvas was found too much for this boat, but with the umbrella sail she carries 360 feet of canvas and sails much faster. A light boat especially adapted for the sail is now being built by Messrs. Thornycroft, of Chiswick, England, the well-known manufacturers of torpedo boats.



THE UMBRELLA BOAT.

Shrinkage of Castings of Metals.

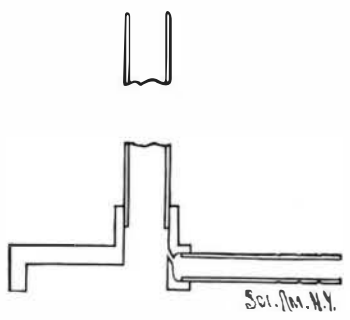
Pure aluminum (13-64 inch)	0·2031	inch to the foot.
Nickel aluminum casting alloy (3-16 inch)	0·1875	" "
Special casting alloy of the Pittsburg Reduction Company (11-64 inch)	0·1718	" "
Thin brass castings	0·167	" "
Tluck " "	0·150	" "
Zinc	0·3125	" "
Lead	0·3125	" "
Copper	0·1875	" "

—Aluminum World.

AN IMPROVED FORM OF BUNSEN BURNER.

A great drawback with the ordinary form of Bunsen burner is the liability of the central jet to become choked up by anything falling down the tube, says Hugh Marshall, D.Sc., F.R.S.E., in the Journal of the Society of Chemical Industry. A single drop of water is often sufficient to extinguish the flame, and a fused borax bead is still more objectionable, owing to the difficulty of properly clearing the jet. This is troublesome enough in ordinary laboratory work, but is much worse with a large practical class. Various methods of getting over the difficulty have been tried more or less successfully. I think, however, I have now succeeded in evolving a form of burner which is a considerable improvement on preceding ones.

The improvement consists in replacing the central



jet by a suitably inclined lateral opening in the wall of the burner itself. The burner is left open right through, and the side air holes are done away with. An air regulator can be fitted on the base in the form of a pivoted diaphragm. A simple form of the burner is illustrated in the diagram. This represents a section through the gas supply tube and inlet (to the right of drawing) and one limb of the tripod base (to the left). The upper tube screws into the lower portion. This consists of a very shallow tripod with circular opening for the tube. At one side of the opening is a block into which the gas supply tube is fixed and through which the gas inlet is drilled. The inclination of the inlet and its diameter depend somewhat on the richness of the gas used.

The advantages of the burner are that the gas inlet does not become choked; anything dropping down the tube passes right through to the bench. Further, if the gas inlet is properly arranged, the flame can be turned down very low without its striking back or the air supply requiring regulation. Again, the air regulator fitted on the bottom cannot jam in the way the usual circular regulator does; in fact, it can be completely removed by the aid of a screwdriver in a few seconds; it is unnecessary except when a luminous flame is desired.

The burner is now in use in Edinburgh and Aberdeen Universities, and works well.

ALTHOUGH there is always a fascination attaching to the invention of a device affecting what might be called the conspicuous and larger needs of mankind, it is probably the improvements on the common articles of daily use that have proved the most profitable to the inventor. As an instance, our attention has lately been drawn to a case of this character, where a device known as the Johnson anti-rattler for thill couplings realized a sale of 1,700 gross in the past six months in the United States alone, and there was an excellent foreign trade, which indicates that Americans are not alone in appreciating improvements of the smaller kind.

Pennock's Electric Power Transmission Plan.

George B. Pennock, a New York electrical engineer, says he has invented a system of electrical distribution which will revolutionize the present methods of railway transportation. His claim is that he can so distribute electrical energy by means of a new kind of third-rail system that a hundred trains can be moved at a cost no greater than is now necessary to move one train, and that he has practically demonstrated the value of his discovery in electric lighting by supplying sixty standard candle power incandescent lamps with one horse power. The inventor was formerly a train dispatcher on the Pennsylvania Railroad, but for many years has given his entire time to electrical subjects. In an interview published in the New York Sun he says:

"In moving cars by electricity we generate at a central point a certain amount of horse power in the shape of electricity. That must be sent out over the route on which the cars run, and there must be as many times the power required to move one car as there are cars. To achieve the results which I claim will come from my system—that is, not to need a power increased in proportion to the number of cars used—I would build a central station midway between the terminals of the line, and in this I would put a 1,000 horse power engine and a 500 horse power dynamo. That is all that would be necessary to move any number of trains. Then I would put up my voltage distributer, which brings about the required result. This is a circular track cut up into 100 segments each 10 inches long. Mounted on it is an electric motor car of one-half horse power designed to run at a very high speed, to complete the circuit of the track 400 times in a minute. It is locked in by two tracks above, one of which carries the current to run the motor, and the other the current from the 500 horse power dynamo to the distributer.

"Between the rails of the railroad tracks, along their whole length, is placed a series of conducting segments, a brass rail one inch in diameter, each segment 500 feet long, the segments separated from each other by a space of three inches. Running side by side with these segments will be a similar but continuous conductor to complete the circuit. Each of the segments in the distributer is connected with wires to a 500 foot segment between the tracks. When all is ready the motor car on the distributer is set in motion, and, as it flies around the circle at the rate of 400 times a minute, it successively closes the circuit between the small segments in the distributer and the large segments between the tracks, and conveys to each segment sufficient electricity to start a train. This current is taken up from the large segment into another but smaller voltage distributer on the train, in charge of the motorman. This consists of ten segments, each attached to a motor on the train. The force of the current is 100 volts. The motorman has charge of this, and by turning his switch can use one motor with 100 volts or ten with a thousand. The current will be taken from the segments on the track to the voltage distributer on the trains by means of a connection underneath the car similar to a trolley pole. One of these trolley wheels or shoes will rest continuously on the continuous rail, so that by generating 500 horse power at the dynamos, distributing it to the segments and putting just enough in each one to start the cars, I can do all the work of the road with 500 horse power. In other words, the same power is intermittently transmitted from one train to another several hundred times a minute. When the cars are started they move on to the next segment, where a new contact is made, thus giving fresh impetus. Finally, I have invented an automatic negative pole stepback to use in connection with the motors on the cars that will multiply the current ten times. [The Editor of the SCIENTIFIC AMERICAN assumes no responsibility whatever for this newspaper story.]