## Surutific Ammiram.

ESTABLISHED 1845
MUNN \& CO., Editors and Proprietors. published weekly at
NO. 361 BROADWAY, NEW YORK.

o. D. MUNN.<br>A. E. beach.

## 

The Scientific American Supplement



Bnilding Edition.





 cor Readers are specially requested to notify the publishers in case of
ny failure delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, MARCH 24. 1894.


## TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT
No. 951.

## For the Week Ending March 24, 1894.



## REMAREABLE bOAT SPEED-32 $1 / 2$ MILES PER HOUR.

The breath of brag in which some of our boat builders have indulged concerning certain American vessels is cut short by the performances of some of the new torpedo boats recently constructed for the British navy. The latest vessel of this class, the Hornet, on a recent trial trip, attained the remarkable speed of 28.33 knots, or over $32 ; \frac{2}{2}$ miles per hour.
This vessel is 180 feet long and $181 / 2$ feet wide, has eight boilers, and four funnels. Displacement, 220 tons; greatest draught, 7 feet 6 inches; estimated horse power, 6,248 . The trial took place on February 23 , on the Maplin mile. Six runs were ma $\cdot$ e, the mean speed being 28.02 , and the best pair of runs being 28.333 knots. The bunker capacity is 60 tons, and on this supply, at 10 knots, the boat would have a radius of action of 4,000 miles. Her armament consists of one 12 pounder, two 6 pounders, and three torpedo tubes, 18 inches. The Hornet is a sister boat to the Havock, which was illustrated and described in the Scientific american of January 13 last.
The Havock made a speed of 27.56 knots. Some forty of these boats are being built in England. Re markable as is the speed of the Hornet, a boat which is expected to go still faster is now being constructed in France.

The following are particulars of the sea-going tor pedo boat Forban, which is now being built at Havre by MM. Augustin Normand \& Co., and which is designed to attain the extraordinary speed of 30 knots or $341 / 2$ statute miles an hour. Length, 144 feet 3 inches beam, 15 feet 3 inches; draught, 10 feet; displacement, 130 tons; indicated horse power, 3,200. The vessel will havetwin screws, and will carry two torpedo ejectors and two $1 \cdot 46$ inch guns. The Forban will be by far the fastest craft afloat. The Chevalier, a torpedo boat of the same length, but of only 2,700 indicated horse has attained a speed of $27 \cdot 22$ knots. The boilers which give these striking results are a specialty of the firm of Normand, and are, it is understood, to be adopted for the new British torpedo boat destroyers Janus. Porcupine, and Lightning, under construction by Messrs. Palmer \& Co., of Jarrow, and for the Rocket. Shark, and Surly, under construction by Messrs. J. \& G. Thomson, of Clydebank.
In view of these new advances in naval construction it is to be hoped Congress will wake up to the necessity of ordering a few vessels of equal speeds to the foregoing. At present we believe the fastest craft in the American navy is between eight and ten miles an hour slower than these new vessels of the Royal navy.

## THE IMPERFECTIONS OF THE OVERHEAD TROLLEY

 SYSTEM.At the recent convention of the National Electric ${ }_{18}^{80}$ Light Association, some very suggestive topics were treated in the papers read before the assembly. One which has attracted most attention was written by Mr. J. H. Vail on the trolley system, with reference to the harm incident to the presentsystem of construction of the return or ground circuit. As is generally known, the trolley system uses an aerial conducting system of bare copper wire, of ten including a feeder and trolley line running parallel with each other. This system connects with one of the generator station bus rods or termi nals, while the other bus rod or terminal connects with the rails and perhaps with a bare wire laid in the earth alongside of them. At the joints the rails are con nected by one or two short wires, which prevent dan gerous heating at these points. The car motors ope rate in parallel with each other, the trolley connections bridging the interval between rail and trolley wire, the car wheels acting as conductors to the rails. Mr Vail's paper went to show that this system was a bad one and produced ill effects besides being uneconomical.
The earth treated as a conductor has long been taken as of no resistance. But like many other things in electricity, this appears better in statement than it proves in realization. For while we may take the statement as correct regarding the earth proper, the problem to be solved is how to secure contact with the earth. A zero resistance of the earth proper may be supplemented by any number of ohms of resistance a the earth plates or other groundingdevice employed
The essence of economy in a parallel are system, such as the electric railroad, is the approximate uniformity of potential at all parts of the line; if a railroad, the potential should not drop greatly, even when the cars are running. This approach to uniformity is a factor which, in a railroad, must become less satisfactory a more cars are used. It is also militated against by high line resistance. With the disappearance of the old time zero resistance of the earth, the return circuit ap pears as an important element in the construction which a station pressure of 500 to 550 volts was reduced on the line to 300 to 325 volts. This means a loss of nearly one-half the energy supplied-a loss sufficient to seriously affect the running expenses, as well as to in
of course, brings about the necessity for a larger gen erating plant than would be otherwise necessary.

This is not the most striking part of the subject however. The return circuit through the rails and parallel wire being in contact with the earth, branch currents go off in all directions, and neighboring water and gas pipes take up a share of the work of the return conductors. The story is told of a person in Boston orits vicinity who got current enough from his water or gas pipe in his house to run a motor. Whether correct or not, the story is a good one. But the current, in going through the moist soil from rail or wire to gas or water pipe, and in its return, is accompanied by electrolysis of the moisture of the soil, which brings about the corrosion of one of the electrodes, which, of course, are the pipes and wires.
Some very remarkable results were cited by Mr. Vail. In one case a pipe was quite destroyed. This goes to show that the trolley system as at present installed not only menaces life, but also property. The electrolyzing of a pipe, bringing about a gas or water leak, may involve a very large amount of damage.

The remedy, as suggested by the writer of the paper referred to, is to use one or more low resistance metal insulated return wires, laid in parallel with the rails and connected at frequent intervals thereto. The rail joints he also would have adequately connected, not as at present with thin wire of relatively small capacity. The heavy wires parallel with the tracks would represent fee lers.
The saving of copper on an electric supply line is very poor economy. It is obvious that the improvement suggested by Mr. Vail would cost a good deal; but the ultimate saving in running expenses would justify the improvement in many cases. It also is wrong to permit the maintenance of a system so imperfect as to involve injury to other property.
The paper is a very suggestive one, and emphasizes the lesson which experience has so slowly taught electric engineers-the importance of good installation. The trolley system has gone through years of tribulation because it was, in its early examples, too cheaply erected. To-day its success is measured by and due to the good qualits of its installation. It is to be hoped that the next improvement, and it may cost more, will be the introduction of a practical underground conduit for electric car propulsion.

## The California Midwinter Fair

The success of the Fair is now assured. The first week's attendance was 124,282 ; second week, 60,459; third week, 61,192; and the fourth week. 122,743. A feature of the Fair is special days. On February 23 was children's day, when 55,871 persons passed the turnstiles, the second largest single day attendance since the Fair opened. On February 22 the awards for fruit were made, representing the southern counties of California. The County of San Bernardino had the best fruit and made the finest exhibit. We believe it shared well also in the California exhibit at the Chicago Fair. One of the important features of the Fair is a representative mining camp, arranged just as it appeared when the forty niners created such an excitement. There is a Manufacturers' building. Machinery Hall, Art building, Horticultural Hall, an ostrich farm, street in Cairo, Esquimaux and Indian villages, the Firth wheel, and numerous other side attractions, which are interesting to see. The foreign exhibits, except in the Chinese and Japanese line, are not extensive.

## Draining of Lake Copais.

The draining of Lake Copais has led to discoveries far beyond what was at first anticipated. Not only has an elaborate system of aqueducts been laid bare, of which we hope later to give full particulars, but in the bed of the lake traces of an ancient settlement have been found, and according to the Berliner Philo. logische Wochenschrift the ground plan of a palace has been made out, which in main outline corresponds to that of Tiryns. Thus it seems that the myth of the flooding of the plain by Herakles corresponded to some actual fact. From the bed of the lake we may hope to recover traces of that ancient civilization to which we attach the name of the hitherto fabulous Minyae. To this race belonged the Argonauts, and, if recent theory be correct, the women hosts of the Amazons. This buried city has been kept intact from the chance marauder by the waters of the lake; we may, therefore, reasonably hope it will yield a rich treasure to the scientific explorer.

The Congress of Ainerican Physicians and
This congress is to meet in Washington on May 29, 30, and 31, and on June 1 next, under the presidency of Dr. Alfred L. Loomis, of New York. The congress is a conjoint triennial meeting at Washington of certain national medical societies, so arranged that while each society preserves its autonomy and has its own meetings, papers, and discussions, the members of all the societies meet together at stated hours to carry out the objects of the congress.

