Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

in which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

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

NEW YORK, SATURDAY, FEBRUARY 16, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 998.

For the Week Ending February 16, 1895.

Price 10 cents. For sale by all newsdealers.

ZERO WEATHER OVER THE UNITED STATES.

Such a drop in temperature as was experienced over the greater portion of the United States, from the Rocky Mountains to the Atlantic, and from the Canada border to the Gulf of Mexico, during the week ending February 9, has hardly had a parallel since the recording of weather changes has become a regular system. Severer weather and heavier snowfalls have been experienced heretofore in limited sections, but the great area and low range of temperature of the storm which had its center in Texas on February 6 was something phenomenal. The temperature was below the freezing point for nearly three days throughout the entire United States, except a small area on the southern extremity of Florida and the California coast up to about Portland. And within the lines which marked the extent of country over which a freezing temperature was being experienced the mercury dropped to the zero point over the greater portion. At New York City, three degrees below zero was experienced, and throughout New England the range was from zero to twenty-six degrees below. It was below the zero temperature also throughout the States of New York and Pennsylvania, in portions of Maryland, Virginia, and the Carolinas, and in the greater part of Georgia, Alabama, and Mississippi, the zero line extending down into the heart of Texas, and thence westerly to the Rocky Mountains, and including the entire territory of the Mississippi Valley and around the great lakes.

In the memorable blizzard of 1888, a much smaller area was affected, the storm being confined mainly to the Middle Atlantic States, and the temperature did not fall so low, although there was a much greater snow fall. The snow fall accompanying the last great cold wave has varied from a few inches in depth, along the coast, to upward of two feet at many points in the interior, and, accompanied as it has been by a high wind, reaching a velocity of seventy miles an hour at Sandy Hook, railroad travel in all directions has been greatly impeded. But perhaps the greatest loss attributable to the cold weather will be that of the Southern fruit crops. The zero point has been reached over a large territory where a freezing temperature has heretofore been but rarely experienced, and the fruit crops of these milder climates cannot but be an almost total loss, it being reported that the Florida orange crop and a great portion of the trees have been entirely destroyed.

A NEW JET-PROPELLED STEAM LIFEBOAT.

The Royal Lifeboat Institution, a benevolent organization supported by subscriptions from the charitable people of Great Britain, maintains many lifeboat stations on the coasts, which are the means of saving hundreds of lives every year. In general, lifeboats are worked by oars and sails. In 1891 the institution caused to be built a steam-propelled lifeboat, worked on the jet principle. That is to say, instead of the ordinary screw propeller, jets of water are used to drive the vessel.

The water jets are produced by means of rotary pumps, and when the jets are discharged from the stern the boat is driven forward. The discharge nozzles are capable of being shifted, so as to direct the jets laterally, in which case the vessel may be turned around or made to move sidewise. The first jet propelled lifeboat proved very useful and successful, and now the institution has added another boat, worked on the same principle. This vessel is named the City of Glasgow. She is 53 feet long, 16 feet beam, 5½ feet deep. Displacement 30 tons. Besides coal, provisions, water and crew, the boat will carry 40 passengers. On each side there are two centrifugal pumps for working the vessel. Engines, 200 horse power. Speed, 8 miles per hour, and capable of towing another boat at same speed. The vessel is propelled and turned with the utmost facility, without the use of the rudder, although, of course, a rudder is provided. Going at full speed the boat may be stopped dead and started astern in 20 seconds.

A somewhat similar jet boat, named the President Van Heel, has been built for the Lifeboat Institution of South Holland, and is operated with much success.

We have on several occasions called the attention of the Navy Department to the importance of having our war vessels fitted with jet pipes and proper connections with the steam pumps, so that in case of need, such as loss of rudder or in an action, this auxiliary means might be employed to steer, swing, or turn the vessel, as circumstances might require. We have also suggested the inquiry whether additional pumps and pipes might not be arranged for connection with the main engines of the ship, so that in case of loss of propeller, or breaking of shaft, the propulsion of the vessel might be still maintained.

These suggestions apply not only to war ships, but also to merchant steamers. The jet system is not capable of yielding so high a rate of speed for a ship as the propeller, but it is a safe and effective method, especially useful for emergencies. It would be a simple and comparatively inexpensive matter on all steamers to arrange jet pipes for steering purposes in case of rudder loss. Such devices should be made compulsory, same as other safety requirements

Charles W. Copeland.

Charles W. Copeland, one of the best known marine and mechanical engineers in the country, died at his Brooklyn home February 5. Mr. Copeland was born in Coventry, Conn., in 1815. Daniel Copeland, his father, was a builder of steam engines and boilers in Hartford, Conn. The plant was established on the premises afterward occupied by the extensive concern of the Woodruff & Beach Iron Works of that city. Charles Copeland was carefully trained by his father in designing and draughting steam vessels. He also received practical instructions in the shops in pattern making, founding, machine fitting, boiler making, and later became the superintendent of his father's establishment. He designed at this time a number of steamers for use on the Connecticut and Southern rivers. Under the guidance of Professor Hackley, of Columbia College, he became an adept in mathematics. In 1836 he accepted a position as designing and constructing engineer in the West Point Foundry of New York, then one of the largest plants of the kind in the country. While connected with this concern he designed and built many marine engines, including those for the United States naval steamer Fulton, the steamboats Utica, Rochester, Swallow, Milwaukee, and Cleveland, and the ferryboats Gold Hunter, Jamaica, Bunker Hill, and Lexington. He built the first iron hull in the United States for a boat which was put in service on Lake Pontchartrain.

In the year 1839 he was appointed constructing engineer to the United States navy, an office similar to that now occupied by the chief of the Bureau of Steam Engineering. During the Mexican war he fitted out what was called the "Mosquito Fleet," consisting of the Spitfire, Scorpion, Scourge, Vixen, etc. At a later period he designed the engines and boilers of the naval steamers Missouri, Mississippi, and the Michigan, for Lake Erie, which was the first iron steamer ever used for naval service. Subsequently he designed the machinery for the naval steamers Saranac and Susquehanna. He then became superintending engineer of the Allaire Works of New York, where he designed and built the machinery for the steamers Pacific and Baltic of the Collins Line, the Panama, the Bay State, the Empire State, the Traveler, and others. In 1852 Mr. Copeland's opinion was called for on the "Steamboat Bill," and he was appointed the first supervising inspector under the new law for the New York district. He held this position for nine years. During the civil war he was engaged in altering and refitting vessels for the Southern rivers, and he introduced double-enders for navigating the intricate channels of the rivers. Since the war, Mr. Copeland has been engaged as consulting and superintending engineer for United States Lighthouse Board and by private individuals and corporations. He designed the steamers City of New York, City of Worcester, and City of Boston during this period. These are only a few of the many works which came under Mr. Copeland's care. He was a man of the strictest integrity, and his reports were always models of accuracy and reliability.

A Water Pipe Trouble.

The way in which pipes sometimes become mysteriously clogged is illustrated by the following from the Sanitary Plumber:

"Arriving at the dwelling containing the troublesome closet, I went in and uncoupled the supply coupling at the valve, and with the water off blowed through the pipe. Judging from the ease with which the air passed through the pipe, it seemed that the supply was not at fault, and the plumber assured me that he had blown through it himself, long before. Nevertheless, I produced a small pocket mirror and directed a light to the interior of the coupling and pipe; there in an instant's glance I detected the cause of the failure. In making the joint which joined the valve coupling to the supply pipe, solder had run through and half filled the bore of the pipe. As the couplings for these valves are large, this would not ordinarily have caused the great reduction in the supply experienced in this case. The bulk of the solder which had run through hung free in the shape of a large lima bean. At the coupling end of the bean it was effectually hinged to the solder of the joint where it run through. One could blow through the pipe easily from the coupling end, but scarcely at all from the supply side, as the air or water would catch the solder bean and throw it across the waterway of the pipe, stopping its egress almost as effectually as would the clack of a check valve put on wrong side to.

"We pinched the solder out of the pipe and the closet worked charmingly. The plumber and his boss looked very crestfallen when the cause of the trouble became known, and did all they could to make amends."

THE Book of Job, written about 1520 B.C., describes very accurately several processes of smelting different metals.