

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXIII.—No. 16.
[NEW SERIES.]

NEW YORK, OCTOBER 16, 1875.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

THE EIGHTY-TUN GUNS.

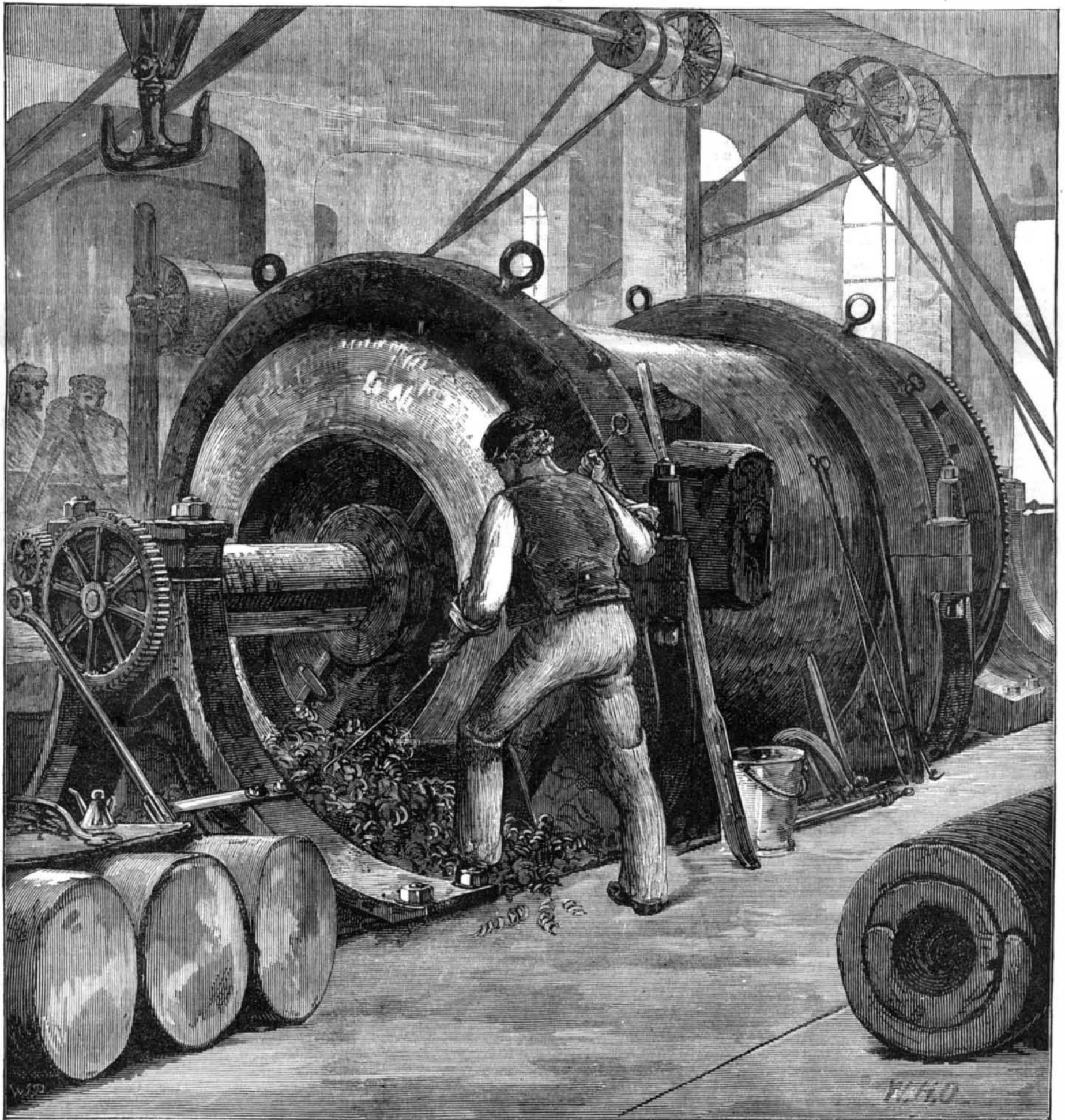
We have on several occasions mentioned the Fraser system of ordnance, which is now adopted in England for artillery of all sizes. The innermost part of the tube is made of steel of the finest quality, and the gun is then built up of wrought iron. The construction of the largest weapons by this means is a Cyclopean labor, and a steam hammer and anvil of unprecedented size have recently been erected at Woolwich for the purpose. The trunnions of the largest guns, each of which weighs eighty-one tons when finished, are made in a piece with a wrought iron coil; this coil is then bored out

by a gigantic apparatus, as depicted in our engraving, and shrunk on to the gun, that is, it is heated red hot and put on in its place, its shrinkage in cooling binding it on the gun with tremendous force.

It will seem in our engraving, that borings of unusual magnitude are cut away by the boring bar. The thickness of the excised pieces shows that a tool of excellent form and of most tenacious material is at work.

The news of the completion of the large gun has arrived. The original design has been somewhat departed from, and the dimensions of the finished weapon are: Length 33 feet,

external diameter, 2 feet at the muzzle and about 6 feet at the breech. Internally the bore measures 27 feet, and in its present state will just admit a projectile 14½ inches in thickness. It is, however, proposed to enlarge this bore, after the proper caliber has been found by experiments, and it is not unlikely that the gun will eventually have a bore of 16 inches. It is rifled in eleven grooves, and the spiral increases as the shot travels along the gun, commencing with nothing in the powder chamber and leaving the muzzle with a twist of 1 in 35. The shot will therefore turn scarcely once on its axis inside the gun, but this has been proved ample to give



BORING THE TRUNNION COIL OF AN EIGHTY-TUN GUN

it the necessary rotation to the end of its journey. The weight of the gun is a trifle over eighty-one tons; but it is to be known in the service as the 80-ton gun. It has been constructed of eight separate wrought iron coils, fitted and shrunk one into the other on the Fraser system.

The projectiles with which it will be proved correspond in size, but not in shape, with the shot and shell with which it will be fired on service. They have been cast in the shell foundry of the Royal Laboratory, and are great bolts of solid iron, each weighing 1,300 lbs. They are flat-headed, and filled with a great number of studs to fit the grooves of the rifling. Special rammers, sponges, and other apparatus have been provided for the proof of the gun, a truck has been constructed to carry the shot, with a special contrivance for lifting it to the mouth of the gun, and the government manufacturers of gunpowder have even provided a special powder. The powder, in its way, is as remarkable as the gun. Each grain of it is a cube an inch and a half in diameter, and the cartridge, which will be 250 lbs. of this powder, will be a large bolster, about the size of an ordinary man. It is proposed to increase the powder charge, if necessary, to 300 lbs.; but this, like the caliber of the gun and the weight of the shot, will abide the result of experiments.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 87 PARK ROW, NEW YORK.

A. E. BEACH.

TERMS.

One copy, one year, postage included.....\$3 20
One copy, six months, postage included..... 1 63

Club Rates.

Ten copies, one year, each \$2 70, postage included.....\$27 00
Over ten copies, same rate each, postage included..... 2 70

By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

VOLUME XXXIII., No. 16. [NEW SERIES.] Thirtieth Year.

NEW YORK, SATURDAY, OCTOBER 16, 1875.

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THE FALL RIVER STRIKE.

During the middle of last summer, the proprietors of the great cotton mills at Fall River, Mass., finding that they had a large accumulation of stock on hand, and seeing that through the general depression of values and reigning dullness in trade, it would be impossible to continue operations as heretofore, notified their working people that either a reduction of wages must be made or the mills would have to stop. The proposed reduction amounted to one ninth the price then paid for piece work. The operatives in answer declined to agree to such retrenchments, but, not wishing to precipitate any open conflict with their employers, compromised matters by taking a "vacation." The mills accordingly ceased work, and the employees have waited in idleness for the arrival of better times. The vacation has now expired. The prices of the large quantities of goods woven before have not advanced, nor does there seem any likelihood of their so doing, while a loss of a million dollars is estimated to have accrued to the city of Fall River through the cessation of work. The mill owners not only, therefore, are unable to go back to old wages, but several declare heavy losses, and advocate closing of the factories for a still longer period.

The workmen, toward the close of their vacation, during which time they or the majority of them had drawn support from the unions, began to realize that, by their self-enforced idleness, they had actually lost a greater proportion of their wages than would have been the case had they accepted the reduced pay. They further saw that winter was approaching, and that the union funds were getting low, and consequently the three classes of which they were composed, the weavers, the carders, and the spinners, met together to settle on some rate of wages at which they would agree to return to work.

But when the workmen came to the factories and announced their intention of coming back to work, the employers, to their astonishment, not only declined to pay more than the reduced wages, but produced an agreement for the workman to sign preliminary to being hired, which provides: 1, that he will not belong to, or be influenced by the action of, any association which assumes to govern the rights of any person to labor for whom and for what he pleases, and 2, that, in case of his desiring to leave employment, he will give ten days' notice. In connection with this, we may mention that there is already a law in Massachusetts which holds manufacturers liable in case of the discharge of an employee without notice, except for incapacity or misconduct. The operatives regarded the proposed agreement as a great injustice, and made riotous demonstrations. At one time troops were under arms, threats to burn the mills were freely circulated, and strong police reinforcements were sent to Fall River from Boston. The number of operatives involved, from 12,000 to 15,000 people, added to the gravity of the crisis.

The whole difficulty hinged on the trade union question. By the discordant element which, it appears, rules in these societies, the idleness of the summer was precipitated, and by them the recent difficulties were fomented, since all accounts agree in stating that hundreds of men were ready and willing to accept the terms of the employers, but were withheld by sheer menace and personal intimidation. That for any manufacturer to refuse to employ union men is a harsh proceeding, we cannot agree. Such is already the rule in some of our largest iron and steel working establishments, and no one is injured thereby.

While we hope that the law will be vigorously enforced against all rioters, we cannot but feel a genuine sympathy for the workmen who have allowed themselves to be led into the difficulty. Their losses will be heavy and severe, and their chances of bettering themselves are palpably hopeless, for it is asserted that mills closed or mills working make little difference to the proprietors during the present state of trade, and while such large stocks are already on hand.

The strike is now over, and all, or very nearly all, the mills have their full complements of workers, who have accepted employment under the conditions above noted. The 15,000 laborers who took part in the uprising have, through their two months "vacation," lost over a million of dollars. Such are the results of the strike.

MENDING A FIFTEEN-INCH SHAFT AT SEA.

An excellent piece of mechanical work was recently accomplished aboard the steamer Ethiopia, of the Anchor line, in

Fig. 3.

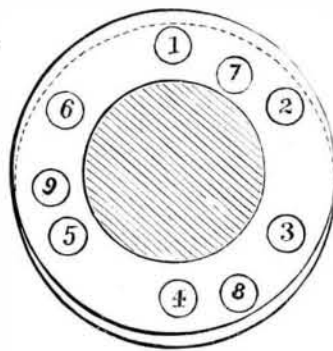


Fig. 2.

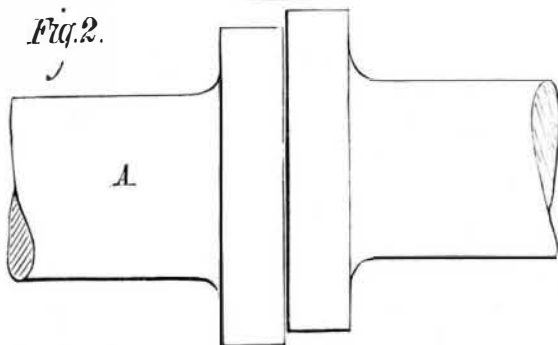
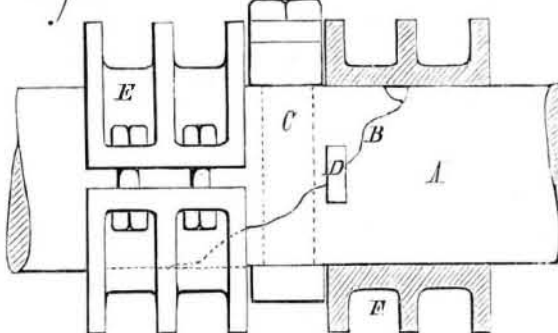


Fig. 1.



the course of that vessel's last voyage to this port. After a heavy gale, and when 1,500 miles from Queenstown, the 15-inch propeller shaft broke in a diagonal fracture. Owing to the confined space of the alley through which the shaft runs, it was very difficult to get at the break, and utterly impossible to use cranes or tackles for handling the immense weight. How the work was accomplished is represented in the annexed engraving (drawn on a scale of 1/2 of an inch to 1 foot), in which A is the shaft, and B, the line of fracture. The broken parts were raised by a jackscrew, the edges

smoothed, and a four inch hole bored through the opposing portions, and into the aperture a bolt, C, was tightly fitted. Four steel drivers, D, four inches long and one and a quarter inches broad, and three quarters of an inch thick, were sunk into the shaft, flush with its surface, just across the line of fracture, serving to bind the parts more closely together. Large clamps, E, were then bolted on the shaft, holding the steel drivers in place, binding the whole together tightly. A still worse difficulty presented itself in the springing or bending of the shaft. Three men, with all the power they could get out of a jackscrew, were not able to reduce the part, which was bent more than a quarter of an inch. So badly bent was the length of shaft behind the break that it was found impossible to couple them together as before, the faces of the coupling refusing to coincide, as shown in Fig. 2, by about 2 1/2 inches. The shaft, therefore, had to be bolted in this position; and as the old holes, Nos. 1, 2, 3, 4, 5, and 6, in Fig. 3, in the couplings would not correspond, one of the couplings had to be turned around, and three new holes, Nos. 7, 8, and 9, three inches in diameter and five inches through, had to be bored. Two of the bearings and plunger blocks under the shaft were broken, and a new support had to be devised. The work was carried on night and day and after eight and a half days, the job was complete.

To Chief Engineer Murray, of the Ethiopia, through whose skill and ingenuity the very difficult operation was accomplished, the credit of the same is due. So thoroughly was the work done that it has been deemed safe to dispatch the vessel on her return trip to Glasgow without any material alterations in the shaft and its fastening.

A DISASTROUS CYCLONE.

One of the most disastrous storms that has ever visited our coast recently swept over a portion of Texas and South-western Louisiana, destroying hundreds of lives and an immense amount of property. The hurricane took its rise in the Bahama Islands, and, crossing the Gulf of Mexico in a parabolic track, struck the Texan coast, curved back, and finally emerged from the Gulf at Key West, and passed off to the east in the direction of the Gulf Stream. The city of Indianola, situated about 120 miles southwest of Galveston and built on a sandy waste which slopes slightly to the water's edge, was almost totally destroyed, but five houses being left standing. In Matagorda, forty miles eastward, four houses only now remain. Velasco in Brazoria county was utterly swept away. San Bernard was completely submerged by the tremendous floods. The towns of Cedar Lake and Salina were washed away with all their inhabitants. Morgan's Flat met a like fate. Of Lynchburg and San Jacinto but little remains; and in Galveston, enormous damages, though less than those inflicted on the other towns, were caused by the floods, which rolled over the island on which the city is located. The total loss of life is unknown, and doubtless will so remain; but the lowest estimates place it at from three to four hundred persons.

Little has been positively determined regarding the cause of these cyclones. From actual observation, it appears that they may originate wherever a lower stratum of warm, moist air is rapidly elevated above the sea level. In this moist air an immense mechanical power is stored up; and when condensation caused by its elevation occurs, its moist vapor turns into rain, hail, or snow, and an influx of air from all sides rushes in to fill the partial vacuum thus formed. It has been proved that this influx toward a central region is immediately followed by the formation of a whirl, the subsequent development of which is due to further supplies of moist air. The cyclone then moves towards the quarter in which, for the longest time, the warmest and moistest air has been rising and producing the heaviest cloud and rainfall, and its tendency as a whole is to travel away from the equator: hence the parabolic course so plainly shown in the recent case. Applying known theories to the circumstances of the latter, there is no difficulty in accounting for the storm. The weather reports published, for the two days preceding that on which the fury of the cyclone broke upon Indianola, show warm rainy weather in the Gulf and a prevalence of strong northerly and northeasterly winds on the south Atlantic seaboard. Hurricanes have repeatedly been known to originate in Florida when a cold wind from the north has swept into the warm, moist air there prevalent, and this one is without doubt due to the same cause. The cold air elevated the warm atmosphere; and probably other circumstances being favorable, the cyclone was generated and took the course already specified. The Signal Bureau reports that the lowest barometer noted was 28.99 inches, with the maximum velocity of wind of 86 miles per hour, at the same period. The terrible effect of the hurricane may be judged from the fact that the prairies south of Indianola are literally strewn with thousands of drowned cattle, deposited by the subsidence of the floods which swept them away. Several light coasting steamers have also been found ten miles inland, left high and dry by the receding waters.

THE POSTAL LAWS--AMENDMENTS NEEDED.

Owing to increase of postage on newspapers and other transient matter by the enactment of a change in our postal laws at the end of our last Congress, it is no longer feasible for publishers to advertise their publications by mailing and prepaying postage on copies of their papers as specimens, and sending them to non-subscribers.

Last autumn we mailed several tons in weight of the SCIENTIFIC AMERICAN to persons throughout the country, and which we paid over \$5,000 postage. The circulation of the same number this year would cost for postage \$7,500. We have concluded not to print an edition for gratuitous circulation this year, in consequence of this increase of postal charges.