Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

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

☞ "The American News Co.," Agents, 121 Nassau street, NewYork.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 25. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, JUNE 15, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

METEORITES, THEIR ORIGIN.

It is a most curious but, notwithstanding this, a well established fact that sometimes stones fall from the sky, and formerly the most absurd hypotheses were invented to explain their formation, in the upper strata of our atmosphere, by the condensation of vapors of solids, as hailstones are formed by the congelation of the vapor of water. Towards the end of the former century, La Place sought their origin at a greater distance; he concluded that as gravitation on the moon is some four times smaller than on the earth, it might be possible that the volcanoes there could propel stones with such a force as to go beyond the limits of lunar attraction into the sphere of terrestrial gravitation, as a velocity double or triple that which we can give to a cannon ball would be sufficient to accomplish this result; this hypothesis was accepted for a time, notwithstanding the objection of astronomers and chemists, the former proving that the observed velocity of the bodies and the force with which they strike the earth were much greater than they could possibly obtain from a source so near as the moon; in fact, astronomers proved that aerolites possess a planetary velocity. Chemists, from their side, pointed out that the chemical composition of aerolites was by no means that of matters ejected from volcanoes, but that they were compounds of metals, as found in earth, but combined in a way different from any terrestrial mineral known; in fact, that the greater number of aerolites were imperfectly mixed alloys of iron and nickel, with 4 to 14 per cent of phosphorus, the iron being on the average present in the quantity of 60, the nickel of 21, per cent. Chladni, in the beginning of this century, founded his theory in regard to the origin of the aerolites on the opinion of Kepler, who maintained that there were more comets and smaller bodies of different kinds flying about in space than fishes in the ocean. Chladni's theory was that, in the interplanetary and interstellar spaces, small masses of solid matter are moving about in countless numbers, either in regular or irregular orbits, and that when they happen to come within the sphere of gravitating attraction of any planet, they will fall towards the surface with a velocity the resultant of their own planetary velocity *plus* the newly acquired velocity of gravitation, *minus* the resistance of the air which surrounds the planet. On reaching its surface, these velocities are destroyed, and the necessary consequence is the evolution of heat, this being nothing but molecular motion, the metamorphosis of mass motion when the latter is forcibly prevented from continuing. This accounts for the heat of the masses when picked up immediately after their fall, while the train of fire exhibited in many instances is easily explained by the consideration that they originally may contain combustible substances which had no chance to burn in the highly rarefied interplanetary medium; but, coming in contact with the oxygen in our more dense atmosphere, and that with the immense planetary velocity, the friction, combined with chemical action, raised the temperature rapidly to the point of combustion.

The latest theory in regard to their origin is that of Proctor, in England. It is based on the recent investigations of the solar atmosphere by means of the spectroscope and telescope, which show that continually the most gigantic eruptions take place in the solar surface, throwing up gaseous matter containing iron vapor, etc., at an initial velocity of more than 500 miles per second to a hight of over 200,000 miles. Proctor thinks that if any denser material is ejected from the bowels of the sun by these explosions, it will never return to the sun again, and will fly off into space, revolve for some time around some planet, and finally descend on the same, as the meteors do on earth. If this view be correct, the specimens of meteoric iron preserved in our cabinets are pieces of the sun.

If we take in account that the spectroscope shows that the most prominent substance in the sun is iron, and that the same is the case in the meteorites, that they are combined chiefly with nickel, another metal found in the sun, forming an ally not found on earth: that they also show a peculiar crystalization, and in general a common origin, the view is by no means so improbable, however startling it may be; it is moreover sustained by the unanimous testimony of all modern observers, who affirm that the solar eruptions surpass in immensity any volcanic eruption which ever takes place on earth, or which, in past ages, must have taken place on the moon.

THE EIGHT HOUR STRIKE IN NEW YORK.

The progress of the eight hour movement here, which until recently appeared successful, has encountered a check which bids fair to result in defeat. Elated by the easy victories gained over the smaller employers, the strikers have carried the war to the doors of the great manufacturing firms and corporations. But here a strong opposition has been encountered. Hitherto the action of the strikers has been characterized by but few breaches of the law, and the public has been led to believe that the revolution might be effected without the usual recourse to riot and violence. This in the beginning was the opinion held by us, but the late reports of the new position taken by the workmen indicates that our city is likely to be disgraced by acts of lawlessness.

This eight hour movement affects every working man in the land, and unless all or a very large majority of the laboring classes afford it an unwavering support, the accomplishment of its design is impracticable. This encouragement from other localities has not, with the exception of a few trifling instances, been accorded. The leaders of the uprising are fully aware of this fact, and, stung by disappointment and at the same time forced to contend against unlooked-for and powerful resistance, they rush desperately to the last extremes, and endeavor, by threats of personal violence, incendiary documents, and other methods of brutal intimidation, to enforce the ends which they have failed to accomplish by peaceful measures.

We marvel that any sensible mechanic can lend himself to such proceedings and virtually take the bread from the mouths of his family or devote the little sum he has laid aside for a rainy day to the furtherance of such principles.

Organized gangs of malcontents have of late infested the surroundings of our large manufactories, seeking to induce the operatives, by persuasion or argument, to join their ranks. Now, however, their policy seems to have changed, and with the utmost audacity they enter the buildings, spread through the shops, and compel the workmen, who may be perfectly satisfied with their hours and their wages, to abandon their labor; and this in direct contempt of the remonstrance of the manufacturer or corporation on whose premises they may be trespassing. The hands having been enticed away or forced to quit work, the next proceeding is a declaration of terms on the part of the League to the employer, coupled with the information that, under no other circumstances save a compliance with the demands therein set forth, will he be permitted to continue his business.

The outrageous nature of these claims is illustrated by the following requisitions made to Mr. J. G. Batterson, the builder of the Masonic Temple on the corner of 23d street and Sixth avenue in this city, and communicated by him to the *Hartford Times*. Mr. Batterson had last fall resisted the strike at his quarry at Westerly, R. I. and has continued to cut granite under the system hitherto maintained, with a certain number of apprentices and last year's rate of wages. He carried that through successively and is now met by the stone cutters in New York with a declaration that he can only be permitted to carry on business in this city by complying with the following exactions: 1st. He must *throw away* all the cut stone which has been wrought during the past six or eight months by "non-society" men and apprentices—amounting to about twenty-five thousand dollars in value—and have it all done anew out of new stone by "union" or "society" men. 2nd. He must reimburse the various trades' unions who contributed money to support the striking workmen in the Westerly quarries, or, in other words, he must pay them all they expended in the attempt to break him down. 3d. He must dismiss all apprentices and recognize the power of all trades' unions. Extra emphasis was given to these requirements by the smashing of various ornamental parts of the cut stone about the building. Mr. Batterson refused acquiescence, appealed to the police for protection—and also continued work with men from his quarries at Westerly.

The detail of a force of police to insure the security of the Masonic Temple and also to protect other threatened points called forth the memorial from the League to the Governor, which, as a specimen of matchless effrontery and insolence, we have never seen rivaled. Like the Southern confederacy, the strikers wish to be "let alone," and they protest against the unwarrantable interference of the police in their peaceful occupations of closing factories, threatening employers, and offering personal abuse and violence to workmen who refuse to agree to their wishes.

We sincerely trust that the Government, both municipal and State, will invoke the full power of the law to repress and punish every act of violence these men may attempt. Ample protection is due to every workman who wishes to continue his labor at old rates; the entrance of committees and delegations into factories should be prevented, and any riotous movement should be crushed with a promptness and severity that would teach these organizations, and bring home to the minds of trades' unions generally, the fact that the use of violence as a means of coercion is beyond their powers, and that irresponsible associations, however numerically great, have no more authority than single individuals to abridge or violate the rights of the citizen.

THE PNEUMATIC RAILWAY BRAKE AND OTHER APPLICATIONS OF THE PNEUMATIC SYSTEM.

The pneumatic railway brake, or Westinghouse brake, which for several years past has been so successfully used on the principal railways in this country, is now attracting great attention in England, where it is considered a remarkable improvement. It is the invention of Mr. George Westinghouse, Jr., of Pittsburgh, Pa. It is used on twenty thousand miles of railway here. It has lately been adopted on the Caledonian railway of Scotland, a first class company. A locomotive and train of six cars has also been recently fitted with it on the St. Albans branch of the London and Northwestern railway, and on both of the above roads the invention has been subjected to the severest practical tests. The train, running at a velocity of 50 miles per hour on a level, was stopped in 16 seconds after turning the air on, within a distance of 260 yards. On a down grade of 1 in 68, train running 60 miles per hour, the stop was made in 23 seconds, within a distance of 308 yards.

The invention, it will be remembered, consists in having an air reservoir placed under the locomotive, in which reservoir a supply of compressed air is maintained by a steam pump. The compressed air is conducted, through lines of double pipes, to a series of air cylinders or engines, one of which is placed under each car for the purpose of working the brakes. In order to apply the brakes, the engineer simply turns a cock which admits air to all the brake engines in the train at once. Nothing could be more effective or convenient. An air pressure of 70 lbs. to the square inch is maintained in the reservoir.

The practical applications of the pneumatic system are becoming yearly more and more various and extended. In London, there are now in operation some nine miles of pneumatic tubes, for the conveyance of letters, etc., under the surface of the streets. For some ten or twelve years, passenger trains were regularly operated on one of the Parisian railways by the pneumatic plan, while in Great Britain, during a series of practical trials with the same system, passenger cars were propelled at a velocity as high as sixty miles per hour. It is true that this method of propulsion has not yet been reduced to the same point of economy that is realized with the steam locomotive; but there are situations where the employment of steam is for special reasons so undesirable that even at an increased expense, a good substitute becomes necessary. As for example, for city railroads, the pneumatic plan, which furnishes rapid speed and pure air, is decidedly preferable to a steam road, which whether placed above or below ground is more or less of a nuisance to everybody.

Another important application of the pneumatic system relates to rock drilling, and is now very extensively employed for that purpose. It was used in the boring of the great railway tunnel through the Alps. It is also employed at the tunnel now being bored through the Hoosac mountains, Massachusetts, which, next to the Alpine tunnel, is the largest work of the kind. The pneumatic drills are also used in boring the net-work of tunnels under the East river, at Astoria, N. Y. In all of these examples a pneumatic pressure of about 60 lbs. to the square inch is used.

Another very beautiful and successful application of the pneumatic system is employed in the construction of the foundations of bridges under water. The great bridge over the Mississippi at St. Louis is an example, the foundations of which were carried down, one hundred and thirty-six feet below the level of the water, by the maintenance of a pneumatic pressure within the caissons of some fifty-two pounds to the square inch. The same system was employed here in the sinking of the foundations of the Brooklyn suspension bridge.

IRON SHIP BUILDING IN WILMINGTON.

Among our maritime manufacturing cities, Wilmington, Del., must now be held to take a very prominent position. During the last eight or nine years, the energies of her capitalists have been directed to iron shipbuilding, and great success has resulted from their efforts.

The city is naturally well situated for shipbuilding purposes, and the facilities for obtaining iron are unexcelled. Two railroad lines extend to the mining regions of Pennsylvania, and the ore is brought by them directly to the shipyards. The latter are all located on the Christiana Creek—a wide and deep stream which forms a junction with the Delaware River at Chester, Pa. Adjacent to Hollingsworth and Harlan's yard is a large dry dock, only rivalled by that at the Brooklyn navy yard, which has just been completed by that firm at a cost of $125,000. The basin is of solid granite, built in terraces. The above firm alone employs 700 mechanics, and another, 500; the whole number employed by the various builders is, according to a correspondent of the *Evening Post*, about 3,000, which is rapidly on the increase with the extending business. The builders