

cends. The two sets of hose are arranged at opposite sides of the frame, and are actuated from a double acting supply and exhaust valve in the valve chest shown at H.

A wagon runs on rails laid over the two wells, and motion is communicated to it by the rising and falling of the excavator. A crossed wire rope runs upon a pair of V-grooved pulleys, each of which has three grooves of different diameters, so that the ratio of the travel of the wagon to the depth of stroke of the excavator may be adjusted. These pulleys, or speed cones, are placed on top of the frame. On the shaft of one of these pulleys is a cone having a spiral path around it, and on the side of the frame near the bottom is a similar cone. Around these two cones passes a pitch chain. The lower cone drives an endless chain traveling in a direction parallel with that of the railway, and to which the wagon is fastened by an arm shown at L, Fig. 4. The speed of the wagon is so varied by the cones, that it moves fastest when under the bucket. The wagon as it comes up for its load strikes against spring buffers which are held back by spring checks, and the same motion which opens the valve to lower the excavator releases these springs, which then exert their force against the wagon.

The wagon is constructed in two segments, hung on centers on which is a pair of intergearing toothed wheels, M. On one center is a disk having a recess for the tooth of the tripping lever, N. When this lever is depressed, the disk is liberated and the weight of the load opens the two segments, which close of their own weight after the load has fallen and are held shut by the tooth dropping into the recess.

The hopper well is closed at the bottom by a number of doors hinged to the keelson and raised by hydraulic rams. Each door is kept closed by a chain and pulley with a toothed wheel on the same shaft held by a pawl.

The pumps for supplying the hydraulic power are set on a cistern containing oil or water, and pump into a valve chest in front of the excavator well; the supply pipe passing first to an accumulator, then to the valve chest, and then to a second accumulator. The accumulators are of sufficient capacity to supply the cylinders for closing the doors of the hopper and to equalize the work of the pumps during the moving of the bucket. There are five ordinary hydraulic valves in the chest, from which all the movements are regulated.

Two hydraulic capstans, located in the bow, move the vessel in any desired direction. One has side chains rove round it so as to wind up on one side and pay out on the other. The forward capstan controls the forward and backward motion of the vessel.

A patent was recently issued to Mr. William Smith, of Aberdeen, North Britain, for the above described excavating and dredging machine.

The Greatest Obelisk.

The Washington correspondent of the *Cleveland Leader* writes: The Washington monument is the wonder of Washington, and its beauty the admiration of both Americans and foreigners. Already over 350 feet high, it rises from the banks of the Potomac a great white marble shaft, piercing the clouds, and backed against the blue of the sky. It is already the grandest obelisk the world has ever seen, and in the æons of the future, should the nations of the day pass away, leaving no more records of their progress than the mighty ones of the Egyptian past, it will surpass the Pyramids in the wonder of its construction. It is already higher than the Third Pyramid, and within a hundred feet of the size of the second. It is taller than St. Peter's Cathedral, and when finished it will be the highest structure in the world. To-day the Cathedral of Cologne, 512 feet high, is the tallest work in the world. Next comes the Great Pyramid, 483 feet high; then the Strassburg Cathedral, 473 feet; then the Second Pyramid, 453; then St. Peter's, 430; St. Stephen's at Vienna, 443; and St. Paul's at London, 334.

Transfusion of Blood.

The *Presse*, of Vienna, lately described an operation of the above kind successfully carried out by Professor Nothnagel in conjunction with Herr Ritter von Hacker. On account of the unsatisfactory results recently obtained in several cases by using human and lamb's blood, it was resolved to try a better method, already suggested by several physiologists. This consisted of a solution of common salt of 0.6 per cent rendered alkaline by two drops of concentrated solution of soda. The patient treated on this occasion was a young man who was in imminent danger from weakness of the heart, consequent upon loss of blood by reason of an abscess in the stomach. An incision was made in a vein in the upper part of the arm, and by means of a funnel-shaped receptacle about two pints and three-quarters of the fluid in question were introduced into the system of the patient, who is now expected to recover.

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NEW YORK, SATURDAY, SEPTEMBER 29, 1883.

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"LABOR AND EDUCATION."

A committee of Congress has been "investigating" these subjects for some weeks past in New York city. The testimony elicited has covered a wide range of topics, and furnished much interesting reading matter for the daily press. Jay Gould has narrated, with lamb like innocence, in a story that reads like a novel, how he accumulated his colossal fortune; Dr. Norvin Green has described the telegraph systems of this and other countries in a way which makes it appear that the Western Union corporation is a great public benefactor; John Roach has told us about ship building, and how necessary are subsidies, if we would once more see a due proportion of the world's commerce done under the starry flag; Railway Commissioner Fink has explained how railway charges are regulated—how railway "pooling" prevents railway "wars"—and all for the public benefit; while many other witnesses, representing various isms, trade organizations, and the different industries, have given some important facts and a good deal of theory as to what Congress should or should not do to promote the cause of education, and for the benefit of the "laboring classes"—so self-styled by the great majority of workers who labor for a low rate of daily or weekly compensation.

This congressional committee was appointed principally in consequence of the numerous "strikes" in various parts of the country—caused generally by trade-union organizations; it has, also, been repeatedly urged that the general government should do something to promote popular education, particularly with regard to the former slave population, and so this subject was joined with the other. Primarily they are very nearly related, and any inquiry or investigation which may have a tendency to the making of wiser laws in either direction cannot be deemed useless. But how can the general government proceed in the direction of ameliorating the condition of wage earners? In this country, where all are equal before the law, it has always been held that labor must, as is the case with all products of labor, find its value according to the demand, and that any interference with the natural law of supply and demand would do harm rather than good. There is, however, a large and growing class who do not assent to this proposition, and who point to the rapidly accumulated fortunes of the masses, to the especial detriment of the poorer classes of laborers. It is this feeling, no doubt, which is most efficiently strengthening the various trade unions to-day, and in deference to which the committee of Congress was appointed.

Of the questions more particularly examined into as affecting labor, the principal ones have been the tariff, a proposed government ownership of railroads and telegraphs, convict labor, and the workings of trade unions. The first named topic has been a "live" one in every counting room, workshop, and debating club almost since the commencement of our history. From the tariff the government derives its principal revenue—but how economical it has been as a method of collecting taxes—how far it has been a prime factor in building up our industries—to what extent it has given extra wages to our workmen—these are questions on which it seems impossible to find any common ground of agreement. We have had too much theory and too small a modicum of the actual facts as they bear on each industry. The conditions are constantly changing, and the inquiries of the committee have thrown but little light upon the subject, while it is safe to say that their results will be absolutely nil as affecting tariff legislation, only as they help to educate the public. The question of government ownership of the telegraph has been agitated ever since England set the example in this direction, and was brought more directly to the attention of the committee by the recent strike of the operators.

Of this, however, as of the suggested government ownership of railroads, it may be said to require only the dullest perception to perceive that any apparent gain to labor thereby would be vastly more than balanced by added taxation. And the reasons why the government should go into such business may be very readily applied in advocacy of its taking up still other branches, until it would be difficult to fix a limit to the possible scope of its interference until the whole present fabric of society was reorganized, as, indeed, some of the witnesses advocated.

There is probably no other department of knowledge, with any pretensions to being styled a science, which is in so "mixed" a condition as the so-called science of political economy. Hardly any two writers even agree in its definition. It has been most broadly and generally characterized by an eminent authority as that which has to do with the sources and methods of material wealth and prosperity in a nation. Here, indeed, is a definition which "surrounds," if it does not get very close to the matter, and through the entire field which it suggests the committee have been making sort of guerilla raids in search of knowledge, so that Congress may legislate more intelligently.

Supposing its members actuated only by the highest motives, it is difficult to see what good can result from such rambling questionings. Theoretically, at least, we all want to have the laws so made and executed as not only to conserve the highest possible state of peace and order in the community, but so that each individual may have an equal chance to earn his or her share of the necessities, the comforts, and the luxuries of life. But when we state the matter in this way, by how much do we differ from the society which Plato would have had in his model republic?—where

each would have had for his task that for which he was best fitted, where there would be no over-reaching by the strong and crafty, no oppression of the weak and feeble, and all would be able to realize the highest happiness possible for mortals. It may be that our investigators, as seems possible with some of their witnesses, have this in their mind; but this is a practical age, and the public would have had greater confidence in their accomplishing something for good, if ever so little, if they had confined themselves to a much narrower range of investigation.

AUTOMATIC SAFETY APPLIANCES.

It is a trite saying, that in the knowledge of danger there is safety; but this, like many other old saws, is only partially true. The many discoveries and improvements which, during the last half century, have been made in science and the mechanical arts, while they have conduced to the comfort and conveniences of the world, have for the most part been fraught with dangerous and apparently unavoidable concomitants. Many accidents, it is true, might be avoided by unremitting watchfulness, but we have to take human nature and physical endurance as we find them, and it is only in automatic safeguards that in many cases reliance can be placed.

Automatic signals, switches, and self-acting gates at crossings are not in as frequent use on our railroads as they should be. These and many other safety devices fail to be adopted, either from some false notion of economy, or from a wrong system of reasoning that, where implicit confidence is placed in them, and they accidentally omit to perform the duty assigned them, the consequences are most serious or fatal. This may be true in a measure, because we have to do with perishable materials and imperfect workmanship, but it nevertheless is unsound argument. There is no necessity to rely exclusively upon self-acting devices against accident, but, wherever the same can, they ought to be adopted as additional means of securing safety, and we think that the time is not far distant when they will be thus employed more generally than they now are. Notwithstanding the much that has already been proposed and done in this connection, inventors should not be discouraged because the harvest is not yet ripe. The field is a wide one, and by no means fully explored as yet.

Railroad accidents occur, at times, owing to the failure of the air brakes to act, and are called into requisition upon some particular occasion, but this does not condemn these devices; they are useful and great means of safety notwithstanding. So it is with automatic safety appliances generally. Additional devices for securing safety and sufficient manual or other force to work them should also be provided. No single safety expedient is reliable. Such devices should always be duplicated or alternatives be at command, and we think that, so far as automatic means are concerned, provision should invariably be made for making them part of the ordinary working plant, so that, although not acting with their full force excepting when needed, they will not rust or bind, but be kept in good working order; or, if this cannot be done, then they should be operated occasionally, at stated periods, to insure their efficiency.

Much attention is now being directed to automatic safety contrivances in connection with that modern substitute for long flights of steps in our lofty buildings, the passenger elevator; and although considerable has been already done in this line, and many inventors may find their proposed expedients anticipated, there is still great room for improvement and a fortune to the discoverer of the best device for the purpose. In the same category should not only be included freight elevators, but the many kinds of hoisting machinery in use for different purposes. Take, for instance, the chain hook tackle or grapple employed in our stores and warehouses for receiving and delivering goods in casks and other like packages. How many men are crippled and lives lost by the slipping of the load from the hooks while being raised and lowered through hatchways from one story to another? This need not and ought not to be, as safety devices to catch and hold the load till the hooks could be re-adjusted might be easily devised. We know of one large warehouse in a neighboring city where accidents from this neglect are of almost daily occurrence.

There are many instances, however, besides these, in which self-acting safety means might be advantageously adopted. We will only mention a few as they occur to us. Automatic fire alarms might be introduced into our dwellings and tenement houses, which either flame or an undue rise of temperature would operate, and so wake the sleeping inmates; this might either be done mechanically or by the breaking or closing of an electric circuit. Self-closing gas taps, too, in the sleeping apartments of our hotels, that is, taps which would close when the light is blown out or otherwise extinguished, and that would require a special manipulation to open them again, might save many a verdant country cousin, careless person, or inebriate from dying of asphyxia. Again, if pistols were made that, by the act of loading them, would expose, and keep exposed till firing them, a plain and unmistakable indicator of their loaded condition, we should read of fewer of those lamentable occurrences in which death results from the foolish practice of pointing at another, though only in jest, a weapon erroneously supposed not to be loaded; and the timid, too, would be less likely to carelessly handle a fire arm that pronounced itself ready to kill.

But why enumerate? The subject of automatic safety appliances is an extensive one, and well worth the attention of

the ingeniously inclined, who would also have the comforting reflection that their efforts were being directed toward the saving of human life.

ASPECTS OF THE PLANETS FOR OCTOBER.

JUPITER

is morning star, and wins the place of honor in the monthly presentation for the surpassing beauty of his appearance as well as for the fact that his approach to the earth will soon bring him into a position favorable for telescopic research. No planet in the solar family exceeds in interest for terrestrial observers the one that holds a place second only to the sun in size and majesty. The desire to learn something new concerning our giant brother increases every year, while the constantly recurring red spots, white spots, and intensely colored belts are proofs of Jovian activity that whet the curiosity of diligent observers. Not many aspects of the huge planet's disk at the coming opposition will escape the attention of eager watchers who make a specialty of Jovian astronomy.

On the 27th, at noonday, Jupiter is in quadrature with the sun on his western side, being the third of the great planets to reach this epoch in the synodic course. The Prince of Planets then beams from the starry depths just 90° in longitude west of the sun, rising about six hours after sunset, being near the meridian at sunrise, and setting about six hours after sunrise. Thus, attended by a brilliant retinue of stars, he travels with stately step on the celestial road, and reigns the brightest of them all through the still watches of the silent night.

On the 19th, at one o'clock in the afternoon, Jupiter is in conjunction with Mars. The two planets are then 59' apart. They will be near enough together to be worth observing when they rise, soon after eleven o'clock, on the evening of the 19th. The ruddy hue of Mars and the golden tint of Jupiter make an interesting contrast, and as clearly determine the individuality of the planet as the familiar features of well known friends distinguish them from each other.

The right ascension of Jupiter is 8 h. 12 m.; his declination is 20° 13' north; and his diameter is 34".

Jupiter rises on the 1st about a quarter after twelve o'clock in the morning; on the 31st he rises at half-past ten o'clock in the evening.

SATURN

is morning star, and ranks second to Jupiter in the exceeding beauty of his appearance, shining with a softer light and paler hue. He contributes little to the incidents of the month, but, holding his position near the Pleiades and Aldebaran, contents himself with playing the part of the celestial gem that shines serenely in the heavens, and attracts the admiration of every one whose eyes are turned toward the stars when his presence crowns the night.

The right ascension of Saturn is 4 h. 35 m.; his declination is 20° 1' north; and his diameter is 18 2".

Saturn rises on the 1st about half past eight o'clock in the evening; on the 31st he rises about half-past six o'clock.

MARS

is morning star, and comes in for the third place, as he has already attained noticeably increased dimensions and taken on a somewhat fiery hue. An event of unusual interest occurs this month in the progress of Mars. The constellation Cancer, or the Crab, contains a nebulous cluster of minute stars known as Praesepe. The cluster is luminous enough to be distinctly seen by the naked eye on moonless nights. On the 24th, at noonday, Mars is in this cluster, and when he rises in the evening about 11 o'clock, he will be an interesting object for observation, especially through a telescope. There is no need of describing his position, for he is then a short distance to the northeast of Jupiter, and can be readily recognized.

On the 31st, at midnight, Mars takes his turn in coming into quadrature with the sun, the fourth on the list, Neptune, Saturn, and Jupiter having taken the precedence. It will be noticed how nearly Mars and Jupiter travel in the same path, and how close they seem together, though hundreds of millions of miles and the whole family of the asteroids intervene between the outermost of the inner group of planets and the innermost of the outer group of planets. We have referred to the conjunction of Mars and Jupiter on the 21st. The right ascension of Mars is 7 h. 43 m.; his declination is 22° 14' north; and his diameter is 7".

Mars rises on the 1st about half-past eleven o'clock in the evening; on the 31st he rises a few minutes before eleven o'clock.

URANUS

is morning star, and ranks as the fourth for the part he plays on the monthly record. On the 13th, at seven o'clock in the morning, he is in close conjunction with Beta Virginis, being only 5' north of the star. It will require a powerful telescope to bring to view planet and star after their appearance above the horizon about four o'clock.

The right ascension of Uranus is 11 h. 41 m.; his declination is 2° 43' north; and his diameter is 3 4".

Uranus rises on the 1st not far from a quarter before five o'clock in the morning; on the 31st he rises at three o'clock.

NEPTUNE

is morning star and enjoys the distinction of being the first of the morning quintet to appear above the horizon. He is called a morning star, although he rises early in the evening. But the outer planets are all classed as morning stars

from conjunction to opposition, regardless of the time of rising. Neptune is rapidly approaching his nearest point to the earth, and if he were not so far away would afford more material for research. To him belongs the honor of being the only planet whose presence was felt and position mapped out before he was actually discovered.

The right ascension of Neptune is 3 h. 15 m., his declination is 16° 12' north, and his diameter is 2 6".

Neptune rises on the 1st at half past seven o'clock in the evening; on the 31st, he rises at half past five o'clock.

MERCURY

is evening star until the 6th, and morning star for the rest of the month. On the 4th, at nine o'clock in the morning, he is in conjunction with Venus, the former moving westward toward the sun, and the latter moving eastward from the sun. Both planets are so near the sun that the meeting will be invisible to terrestrial observers.

On the 6th, at eight o'clock in the evening, Mercury is in inferior conjunction with the sun, passing between the earth and the great luminary, and becoming morning star as he reappears on his western side.

On the 20th, at two o'clock in the afternoon, he is in conjunction with Gamma Virginis, being 1° 7' south of the star. Bright-eyed observers may possibly see the near approach of star and planet on the morning of the 20th, for the planet is then visible, and the star will be a guide to its position. But the atmospheric conditions must be nearly perfect, or the observation will be in vain.

On the 22d, at ten o'clock in the morning, Mercury reaches his greatest western elongation, being at that time 18° 22' west of the sun. This is the last favorable opportunity during the year for seeing Mercury as morning star. He rises on the 22d an hour and a half before the sun, and must be looked for 9° north of the sunrise point. He will be visible at that time, and also for several days before and after elongation.

The right ascension of Mercury is 13 h. 5m., his declination is 10° 34' south, and his diameter is 9 8".

Mercury sets on the 1st about a quarter before six o'clock in the evening; on the 31st he rises a quarter after five o'clock in the morning.

VENUS

is evening star, and the only planet playing the part of evening star during the entire month. She might as well be blotted from the sky as far as observation is concerned, but she will make up all deficiencies by the splendor of her appearance in midwinter.

The right ascension of Venus is 12 h. 42., her declination is 3° 12' south, and her diameter is 10".

Venus sets on the 1st a few minutes before six o'clock in the evening; on the 31st she sets about half-past five o'clock.

THE MOON.

The October moon falls on the 16th, at 37 minutes after one o'clock in the morning, Washington mean time, or 49 minutes after one o'clock, New York time. The new moon of the 1st passes near Venus and Mercury on the morning of the change. The full moon of the 16th is in close conjunction with Neptune on the 17th. She is in conjunction with Saturn on the 19th, about four o'clock in the morning, being 1° 13' south. In some localities between 47° and 70° south declination, the moon occults Saturn for the seventh time during the present year. On the 23d, the moon is at her nearest point to Jupiter and Mars at nearly the same time. On the 27th, she passes Uranus, and on the 29th she is near Mercury for the second time. On the 31st, the second new moon of the month is near Venus.

ECLIPSE OF THE MOON.

There will be a partial eclipse of the moon on the 16th, visible in the United States and on the Pacific Ocean.

The eclipse will commence at 1 h. 2 m. A.M., New York time. The middle of the eclipse will occur at 1 h. 58 m. A.M. The eclipse will end 2 h. 54 m. A.M. As but twenty-eight one-hundredths of the moon's diameter is obscured, the phenomenon is remarkable for being the only lunar eclipse visible in this latitude during the year.

ECLIPSE OF THE SUN.

An annular eclipse of the sun will occur on the 30th, visible on the Pacific Ocean, and partly visible on the Pacific coast of North America and Asia. As the ring of sunlight surrounding the moon's dark disk will be invisible in this region, the event will be of little importance. An annular eclipse, though a beautiful phenomenon, bears no comparison to a total one in scientific importance.

The inhabitants of the islands of the Pacific will not be likely to entertain the men of science during its occurrence, though the moon casts her shadow over the same waste of waters and not very far distant from the lone island made memorable as the point of view for observing the total eclipse of the 6th of May.

Product of the Hen.

The hen has in her ovaries, in round numbers, more than 600 egg germs, which develop gradually and are successfully laid. Of these 600 the hen will lay 20 in her first year; 135 in her second, and 114 in the third. In each one of the following four years the number of eggs will be diminished by 20, and in her ninth year she will lay at most 10 eggs. In order to obtain from them sufficient product to cover the expense of alimentation, they should not be allowed to live over four years.—*Annales de la Sociedad Odontologica, Havana.*