SCIENTIFIC AMERICAN

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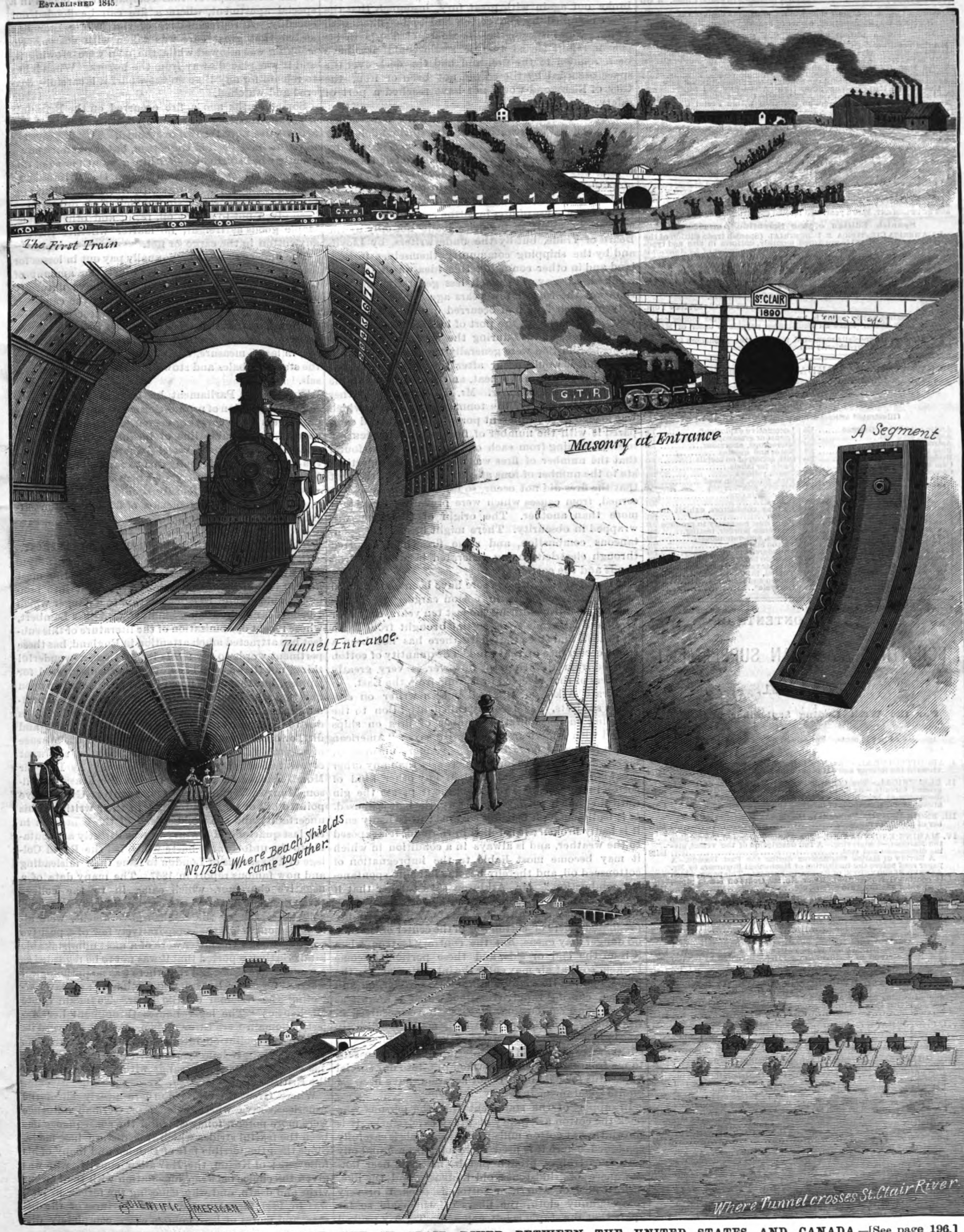

THE GREAT RAILWAY TUNNEL UNDER THE ST. CLAIR RIVER, BETWEEN THE UNITED STATES AND CANADA.—[See page 196.]

Scientific American.

ESTABLISHED 1845.

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NEW YORK, SATURDAY, SEPTEMBER 26, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 821.

For the Week Ending September 26, 1891.

Price 10 cents. For sale by all newsdealers.

FIRES IN COTTON CARGOES.

According to the records of the British Board of Trade, there have been 171 fires on cotton-laden ships crossing the Atlantic from this country during the last ten years. The cause most frequently assigned for these fires is spontaneous combustion, but the various investigations which have been made have failed to furnish sufficient evidence to establish this as the true cause. A very serious fire occurred on the Inman line steamer City of Richmond in June last when she was on a voyage from New York to Liverpool.

Steam was turned on the burning cotton, and this kept it under control until the vessel reached Liverpool, and had commenced unloading, when the fire broke out again with great fury, insomuch that the space occupied by the cotton had to be filled with water. The inspector for the Board of Trade in his official report stated that if steam could not have been applied to the fire, and had the deck over the space occupied by the cotton not been of iron, the City of Richmond would not have reached a port of safety.

This fire, taken in connection with the many which have preceded it, recently caused a spirited debate in the English Parliament. The debate was started by an inquiry as to whether the government intended taking any steps to prohibit the carrying of cotton on passenger ships. In replying to this question, Mr. Balfour said that, in regard to spontaneous combustion being a cause of fires in cotton cargoes, he thought that as the result of inquiries made not only by the Board of Trade, but by the underwriters, by Lloyds and by the shipping community themselves in England and in other countries, this idea was, if not discredited, at any rate much less generally held now than was the case a few years ago. Of the 171 cargoes in which fires had occurred during the last ten years, 81 occurred in the port of loading, 45 in the port of discharge, and 45 during the voyage. If spontaneous combustion were generally the cause, it was obvious that it would occur after the cotton had been allowed a little time to heat, and not so much in the early days after loading. Mr. Balfour said further that he had examined the tonnage of the cotton which was loaded at the different ports in America and compared it with the number of fires which had occurred in ships coming from each of the ports and he found that the number of fires was not very disproportionate to the number of tons at each port, and he thought that the fires did not occur, so far as America was concerned, from causes which were prevalent in one port more than another. The origin of the fires was wrapped in obscurity. There might be cases of spontaneous combustion, and some fires had occurred through electricity being generated between the iron bands and the cotton.

It is stated that, while there have been one hundred and seventy-one fires in cotton cargoes from this country to Europe during the last ten years, only four fires have taken place in cotton brought from India up to 1887, and since that date there has not been a single occurrence of that kind. The quantity of cotton shipped from this country, however, is very greatly in excess of that received in Europe from the East.

Edward Atkinson, the well known writer on economic subjects, has recently called attention to the alarming increase in the number of fires on ships loaded with American cotton. He says: "American cotton is treated more barbarously, more unsuitably, more wastefully and more dangerously than any other great staple of any kind or than any other kind of cotton in the world. From the time it passes the gin until the time it reaches the factory, the bale is abused. It is badly made; it is badly covered; it is badly cut; it is badly broken; it is rolled in the mud; it is exposed to the weather, and is always in a condition in which it may become most liable to the impregnation of cottonseed oil, and thereby become liable to spontaneous combustion." Mr. Atkinson says further that if cottonseed oil is extracted where the cotton is ginned, oily locks may get into the bale. Where such impregnated fibers of cotton are in the center of the bale no danger may ensue, but the contrary is true when it is on the end or side, and these portions become broken, so that air may enter the interstices among the fibers, making the right combination of fiber, oil and oxygen, causing rapid oxidation, which is known as spontaneous combustion. "Fires have occurred in risks under my supervision which could be directly traced to this cause," says Mr. Atkinson. "Locks of cotton saturated with cottonseed oil have been sent to me from factories which, when put into our special apparatus for oxidation or for aeration, have been set on fire spontaneously."

In support of the statement that the persons who pack the cotton are guilty of great carelessness, it is shown that at cotton mills where each bale is carefully examined before it is used there have been found oily cotton, cartridges, broken pistols, matches, beer bottles, pieces of grindstones, old hammers and the like. A great deal of American cotton is packed in very coarse gunny cloth, the fibers of which are so far apart that the staple is left exposed. Tightly packed and well covered cotton is much less likely to catch fire than that which is put together in a haphazard way, and the British Board of Trade reports that it was one of the difficulties encountered in their inquiries that if a spark fell upon cotton, it was often proved that the fire ran along the edges of the bales until it came upon some half packed bale, where it settled.

While persons interested in shipping claim that cotton is just as safe a cargo as anything else, it is seen that special precautions are taken to guard against fire. One of the officials of the Norddeutschen Lloyd line recently stated that when cotton is carried in one of the steamships of that company it is placed in a special apartment, where a fire can be flooded out speedily. A representative of the White Star line stated that great care was taken with cotton. No smoking was allowed while the men were stowing it, and it was placed away from the boilers. When it has to remain for any time on the wharf it is carefully covered and watched.

Some months ago a fire occurred on the Britannic while the vessel was at sea. The ship was stopped and a few bales were thrown overboard. The fire was believed to have been in the cotton, but it was not known exactly what started it. Within a month or so of this occurrence there was a small fire on the Britannic as she lay at her pier. It was supposed that oil had gotten into some cotton; since which time orders have been given not to accept oil, resin, and other inflammable goods as freight, no matter whether there is any cotton in the cargo or not.

The underwriters, who annually pay out in losses for fires in cotton cargoes many times the amount of premiums received from such risks, have naturally given considerable attention to tracing the causes of such fires. An officer of one of the largest companies in New York stated recently to the writer that the numerous fires which have occurred in cotton cargoes are, in large measure, due to lack of care in packing the staple in bales and stowing it in the holds of vessels.

The English Parliament has gone so far as to consider the question of prohibiting steamships which take passengers from carrying cotton. If such a law were enacted, a profitable line of business would be made unavallable for these vessels, whereas if the cause of the numerous fires is really due to careless handling of the cotton in this country, of which there seems to be very little doubt, the remedy should be promptly applied here, so that this menace of fires in cotton cargoes may be removed.

THE CONTAGION AND RAPID SPREAD OF LEPROSY.

In continuation of the article in the last SCIENTIFIC AMERICAN (Sept. 19), I desire to point out the most likely cause of the introduction of the taint into nonleprous blood, and to call attention to a danger which I believe is now becoming imminent. Agnes Lambert, whose recent epitomization of the literature of this subject has attracted much attention in England, has these pertinent words to say: "Is it not, then, a wonderful thing, not that a cure has not yet been discovered for leprosy, but that with men of science it is still an open question whether leprosy is communicable or incommunicable, contagious or hereditary; whether it is due to insufficient and bad food, or bad climate and dirt, or all combined; to a lack of meat or the absence of vegetable diet; to the use of salt fish or the want of salt? Such, however, is the case!" As Drs. Sir Morell Mackenzie, Vandyke Carter, Sir Erasmus Wilson, Munroe, Wynne, and Rev. Ignatius Grant have pointed out or tacitly admitted in their writings, this uncertainty and the rapid spread of the contagion in the last quarter of a century is very directly attributable to the unfortunate haste which led the Royal College of Physicians of London to issue their misleading and now famous report in 1867. The many data of a negative character, which came in to the college through the medium of the world-wide consular and colonial service of the English government, were allowed to outweigh the comparatively few of a positive nature, though the latter were of a most unmistakable kind. So they reported that it was not to be regarded as a contagious disease and that there was no pathological warrant for lazar houses, segregation or any laws affecting the freedom of the leper. To again quote Mackenzie: "The leper houses throughout her Majesty's domain were thrown open. Each discharged its measure of pollution into the stream of healthy life near it. * * If leprosy slew its thousands before, it has slain its tens of thousands within the confines of the British empire since 1867."

Where Great Britain led, there nearly all of the Americas, save where French or German influence were more potent, followed; and the consequence has been the fearful strides which this disease has made. Since then the terrible fate of Damien and many of his followers; of Keanu, the Hawaiian convict, who was given the choice between inoculation with the leprous virus and death, and who, choosing the former in 1885, was in 1888 far advanced in the tortures of the disease; and scores of less famous cases, completely dis-

prove the stand then taken by the Royal College, and it is doubtful if to-day a single one of their committee of that time could be found to defend that position in the light of recent facts. That report, however, forever did away with any of the theories which had for so long done duty in attempting to account for the exciting cause of leprosy. That it thrives in frigid Norway and Upper Canada, along the torrid Amazons and in Ceylon; in interior India, where fish is rarely eaten, and in the West Indies, where it is the commonest animal food; in Oahu, where cleanliness is now reduced almost to perfection, quite as well as in Hayti, where the word clean must have become obsolete; as well among the pork-eschewing Jews of Jamaica as the pig-loving natives of Tahiti, proves that in climate, soil, and food we will hunt in vain for its origin.

Dr. Wynne, of the Robben Island leper farm, Cape Colony, sheds much light on this obscure subject, when he writes: "Until I came to Robben Island, I was not aware that this [communication of leprosy to animals] might be possible, for I had never even heard of its being probable. * * Two years ago I shot some two dozen pigeons. * * Among them I found two suffering from leprosy, with the bowed legs and incurved claws and with nodular or hypertrophied articulations. * * From time to time leper mice have been caught in the leper wards, presenting the usual characteristics of leprosy. * * I am indebted to Cæsar Africanus for calling my attention to some young pheasants suffering from the same affection. * * An old turkey cock may be seen to-day prowling about the doors of the leper wards affected with unmistakable leprosy. Several young turkeys limp about with him showing the same symptoms."

There is but one way in which pigeons, turkeys, mice, etc., could become thus tainted, *i. e.*, by eating food handled by lepers. And this should speak volumes to the people of the United States on this question. If the terrors of trichinosis can warrant our French and German cousins in closing their markets to our pork, what may we not claim as our right to legislate regarding the leper-handled products of the north torrid zone which is just south of us? Trichina kills one patient, and quickly; lepra, while it usually results in a living death that may last for a score of years, is too apt to leave its seed behind in the innocent progeny. I know it will at once be urged that we have been getting tropical fruits and other supplies from the West Indies in large quantities for over two decades and that no harm has yet resulted. To this I would reply that it is a well known characteristic of this disease that it may lurk in the system for many years before becoming apparent even to the victim.

Cases are on record where a wife has lived for ten years with a leprous husband, before any indication of the taint was observable in her; or where children have almost reached maturity before its inherent effects became manifest. Father Damien was some years with the lepers of Oahu before he discovered his own impending doom by spilling scalding water on his foot and finding that it gave him no pain; a French creole, never suspected of nor suspecting the leprous taint, had a deep hole eaten into his thigh by rats during the night, and not until it was discovered did he realize that eight years before he must have contracted the contagion which had thus killed sensation; and, further, it may be replied to this claim that these cases prove not alone that the taint is long in manifesting itself, but that medical skill is often deceived for years by the symptoms of the disease. I myself have acquaintance with an American physician, a graduate of one of the leading medical schools of this country, and a licentiate of the Royal College of Physicians, who married into a leprous creole family in the West Indies, though the taint had maimed the bride's father, was very observable in a sister and had carried a brother to an early grave. Yet he was blinded to its nature and confidently announced his ability to cure the trouble, which he considered to be of a mild scrofulous nature. He has since that had dread cause to repent his very imperfect diagnosis. I mean no disrespect to American and English medical men when I emphatically state that I do not believe that there is one in one thousand of their number who is able to detect leprosy in its early stages; and perhaps not one in ten of that small number would know what it was best to do with a leprous patient.

Even to-day, the men in New York who have to deal with this problem in carrying out the laws affecting contagious diseases are not agreed as to whether a loathsome, pest-ridden Chinaman shall be isolated or allowed the same freedom as is given to the uncontaminated. In Jamaica, one member of the Royal College sends all patients coming under his notice to the Lepers' Hospital, at Spanishtown, while a local magistrate, acting under the results of the College's report for 1867, allows a woman whose fingers are fast disappearing to sell fruits and nuts to the passing school children. In St. Kitts the medical authorities allow a leper to teach school, and in Trinidad a medical board recommend entire segregation. A railroad in India leaves one terminus from a station where a leper punches the tickets and hands them back to the traveling public, and at another station a leper, whose hands are so far gone as to compel him to wear gloves in the streets, cooks the food at the railway restaurant. Yet, between these stations there is a segregation settlement, where leprosy is sternly dealt with. These are from among many instances of the present total lack of agreement and knowledge on the part of the Anglo-Saxon medical profession in this respect.

In this country we consume over $4,000,000 worth of bananas, over $2,000,000 of oranges, over $1,600,000 of minor tropical fruits, over $15,000,000 of tobacco, and smaller quantities of other like products, which come from lands were leprosy is well known. I have frequently stood on wharves in Jamaica and noted pronounced cases of leprosy going by in ceaseless rounds carrying bananas from the store house to the loading vessel. I have stood in a South Cuban port and watched a leper, with but three fingers left on the right hand, and those badly eaten with leprosy, rolling cigarettes for exportation. The researches of Dr. Armauer Hansen, of Norway, the discoverer of the leprous germ, *bacillus lepræ*, are quite sufficient to show that bananas or tobacco so handled are far from being safe articles of importation. Unless special precautions are taken to avoid eating the exposed parts of the banana, not completely covered with the skin, the risk, though it may be very, very slight, is nevertheless existent. The cigarettes should be entirely shunned. The American-made article is sufficiently injurious in its effects. If the smoker must tempt fate, let him content himself with the domestic product.

If this is a danger—and I believe I have greatly understated it—have we no right to notify such countries as Trinidad, Demerara, Barbados, Haiti, Jamaica, Cuba, Mexico, and others whence we desire a constantly increasing supply of food products, that the time has come for them to deal with this problem in a firm and enlightened manner, if they would retain our trade? It is bad enough to visit a presumably enlightened land, such as Jamaica, for instance, and find a partner in whom the taint is becoming evident facing you for the dance at a governor's ball; from that the panic-stricken dancer may flee, though with hands on which the skin is unbroken, he probably runs no risk if his ablutions be thorough afterward. But how shall we be protected against the employment of lepers in the handling and manufacturing of our food products? That surely calls for attention from our State Department. H. P.

POSITION OF THE PLANETS IN OCTOBER.

JUPITER

is evening star, and, though losing a little of the prestige that marked his course in August and September, still retains his position as monarch of the starlit October nights. Observers will notice a change in the time of his appearance. He is high above the horizon when it is dark enough for the stars to come out, and sets in the small hours of the morning. He is on the meridian at 8 o'clock, and sets about half past 1 o'clock on the 31st. His diameter has decreased about 5".0 since opposition, but it makes no perceptible difference in the brilliancy of his light. The prince of planets is leaving us, and traveling toward the sun; the earlier rising and setting and the lessening diameter are the tangible proofs of his obedience to the great central orb, who sways his course as irresistibly as he does that of the tiny atoms of a meteor swarm.

The moon is in conjunction with Jupiter three days before the full, on the 14th, at 6 h. 46 m. A. M., being 3° 57′ south.

The right ascension of Jupiter on the 1st is 22 h. 48 m., his declination is 9° 14′ south, his diameter is 46".2, and he is in the constellation Aquarius.

Jupiter sets on the 1st at 3 h. 29 m. A. M. On the 31st, he sets at 1 h. 22 m. A. M.

URANUS

is evening star until the 25th, and then morning star. He is in conjunction with the sun on the 25th, at 6 h. A. M., when he makes his appearance on the sun's western side and commences his role of morning star. The synodic period of Uranus, or the time it takes him to travel from conjunction to conjunction, is 369 days, while his sidereal period is 84 years. It will be noticed that the more distant a major planet is from the sun, the shorter is its synodic period, for, the slower the planet moves, the less space will the earth, after completing a revolution, have to travel to come into line with the planet and the sun. In the case of Jupiter, the synodic period is 1 y. 34 d.; for Saturn, it is 1 y. 13 d.; for Uranus, it is 1 y. 4 d.

Uranus while evening star is in conjunction with Venus on the 17th at 1 h. 40 m. A. M., being 21′ south. He is in conjunction with Mercury on the 26th, the day after he becomes morning star, at 7 h. 31 m. A. M., being 10′ south.

The right ascension of Uranus on the 1st is 18 h. 53 m., his declination is 11° 7′ south, his diameter is 3".4, and he is the constellation Virgo.

Uranus sets on the 1st at 6 h. 30 m. P. M. On the 31st, he rises at 5 h. 57 m. A. M.

MARS

is morning star and is slowly making his way toward the earth. Saturn overtakes and passes him on the 12th, when the planets are in conjunction, at 10 h. 25 m. P. M., Mars being 52′ south.

The right ascension of Mars on the 1st is 11 h. 14 m., his declination is 6° 11′ north, his diameter is 4".0 and he is in the constellation Leo.

Mars rises on the 1st at 4 h. 7 m. A. M. On the 31st, he rises at 3 h. 44 m. A. M.

SATURN

is morning star. The noteworthy event in his October course is the reappearance of his ring on the 30th. The plane of the ring then passes through the sun, its northern surface comes into the light, and the southern surface enters into shadow. The ring continues to open until in about seven years it is open to its widest extent, then gradually closing, it becomes again invisible about 1906. Saturn rises at the close of the month three hours and a half before the sun, and may be found north of the star Beta Virginis.

The moon is in conjunction with Saturn on the 1st, the day before her change, at 7 h. 26 m. A. M., being 2° 59′ north.

The right ascension of Saturn on the 1st is 11 h. 36 m., his declination is 4° 41′ north, his diameter is 15".0, and he is in the constellation Virgo.

Saturn rises on the 1st at 4 h. 32 m. A. M. On the 31st, he rises at 2 h. 52 m. A. M.

VENUS

is evening star. There is little to be said of her as she makes her slow progress eastward from the sun, keeping so close to him that there is only an interval of twenty-seven minutes between sunset and the time of her disappearance below the horizon.

The new moon of the 2d is in conjunction with Venus on the 3d, at 2 h. 18 m. A. M., being 2° 36′ north.

The right ascension of Venus on the 1st is 12 h. 45 m., her declination is 3° 30′ south, her diameter is 10", and she is in the constellation Virgo.

Venus sets on the 1st at 5 h. 47 m. P. M. On the 31st, she sets at 5 h. 21 m. P. M.

MERCURY

is morning star until the 27th, and then evening star. He is in superior conjunction with the sun on the 27th at 9 h. 35 m. P. M., when he completes his synodic revolution of 116 days, and comes into line with the earth and sun, being beyond the sun and at his greatest distance from the earth.

The moon is in conjunction with Mercury on the 1st at 2 h. 12 m. A. M., being 3° 31′ north.

The right ascension of Mercury on the 1st is 11 h. 34 m., his declination is 4° 41′ north, his diameter is 6".2, and he is in the constellation Leo.

Mercury rises on the 1st at 4 h. 29 m. A. M. On the 31st, he rises at 6 h. 47 m. A. M.

NEPTUNE

is morning star. His right ascension on the 1st is 4 h. 30 m., his declination is 20° 6′ north, his diameter is 2".5, and he is in the constellation Taurus.

Neptune rises on the first at 8 h. 27 m. P. M. On the 31st, he rises at 6 h. 29 m. P. M.

Mars, Saturn, Uranus, and Neptune are morning stars at the close of the month. Jupiter, Venus, and Mercury are evening stars.

Railway Conductors' Exhibit and Fair.

A unique sort of an exhibition and entertainment is to be held at New Haven, Conn., during the week commencing October 12, for the benefit of a society of railway conductors and the members of their families. It will be an exhibit and fair under the management of officials of different railway divisions in Connecticut, including the New York, Hartford, Shore Line, Air Line, Northampton, Naugatuck Valley, Housatonic, Danby and Norwalk, and New Haven and Derby, and others. Inventors and manufacturers of railway appliances and supplies of all kinds are invited to exhibit their productions, applications for space to be made to Mr. John McCarthy, 68 Church Street, New Haven.

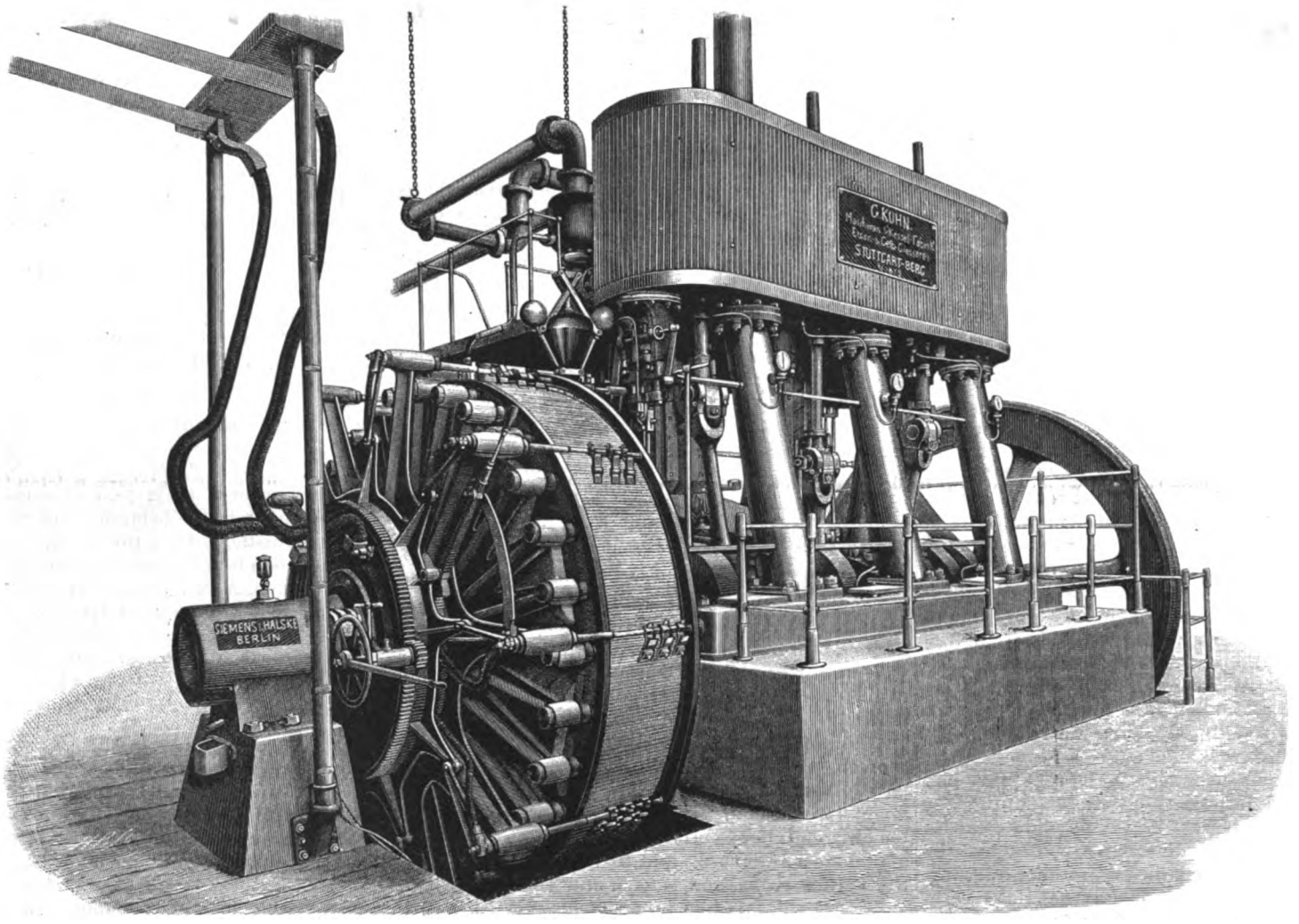
A Bow Propeller.

An exhibition of a method of propulsion devised by Mr. Thomas Mills, of Queensland, was recently given in Glasgow. Mr. Mills' invention consists in the placing of the propeller at the bow instead of the stern of the ship. He states that he has made the change for two reasons—first, that the revolution of the screw propeller in its ordinary position at the stern of the vessel produces a vacuum, which must be filled by the inrushing water ere the ship obeys the forward impulse; and second, that the water at the bow of a ship offers resistance to its movement. Mr. Mills thus places his propeller at the bow. The shaft is carried through the bow, and carries a conical propeller with a diameter nearly as great as the beam of the ship. The outside of the cone consists of webs projecting at right angles to the surface, and arranged in a spiral. The action is thus a boring action.

THE FRANKFORT ELECTRICAL EXHIBITION.

According to *Industries*, Messrs. Siemens & Halske have by far the most important exhibit in the exhibition. They exhibit practically everything within the scope of the exhibition. They begin with a double central station; one part is direct current with batteries, the other alternating with transformers. As if this were not enough, they add extensive exhibits of railway signals, scientific instruments, transmission of energy plant, telephones, telegraphic instruments, electric railway and tramway work, and electro-metallurgy. They also exhibit a model of an electrically lighted theater, also an extensive display of marine electrical gear. The exhibit is so extended and complete that they publish a special catalogue of 150 pages.

We cannot afford space to describe the whole of Messrs. Siemens & Halske's exhibit, so we will devote our attention to their electric light and power machines. They have made up a sort of complex exhibit, containing combinations of direct and alternate current generator motors and transformers all coupled up together, and transforming from one system to the other and back again, and to all sorts of different pressures and currents. The station works incandescent lamps, direct current arc lamps, alternating arc lamps, tramways, search lights, and motors, and these are scattered about over the whole exhibition.



THE FRANKFORT EXHIBITION—SIEMENS & HALSKE'S CONTINUOUS CURRENT DYNAMO.

The electrical power is generated by two dynamos, which are the largest in the exhibition. One is an alternator, the other a continuous current machine, and either of them can alone supply the whole distributing system. The engines are both of the vertical marine type, as shown in the illustration. The continuous current machine is driven by a triple-expansion condensing engine, by Messrs. G. Kuhn, of Stuttgart-Berg. It has three cylinders, of 20 in., 28 in., and 47 in. diameter respectively, and 2 ft. stroke. It develops 400 h. p., 500 h. p., and 600 h. p. when run at 80, 100, or 120 revolutions per minute. The dynamo, made according to Messrs. Siemens' latest design, is coupled direct to the engine shaft. It is a ten-pole machine, with radial electromagnets placed inside a Gramme armature of 10 ft. diameter, giving a normal output of 330,000 watts at 65 revolutions per minute, or of above 600,000 watts at 100 revolutions. An interesting feature of these machines is the total want of a special commutator. The outside winding is made of solid copper strips, 1·2 in. high by 0·24 in. broad, insulated from one another by fiber. The whole of the winding is turned up true on the outside, and ten sets of brushes, corresponding to the ten poles of the machine, collect in parallel. These are mounted on a star-shaped casting mounted on the outside bearing of the engine proper. This arrangement is exceedingly simple and very accessible. The brush holders are so constructed that every brush can be independently adjusted during work without disturbing the others, and at the same time the position of all the brushes may be altered at once by an ingenious and simple device, and all the brushes can be lifted off or put on the armature simultaneously by moving the controlling lever. All the positive and all the negative brushes are connected in parallel, and the current is carried off by two thick but flexible cables visible above the bearing. This dynamo runs at 150 volts.

Astronomical Notes.

At the recent Cardiff meeting of the British Association, Professor H. A. Newton, of New Haven, U. S. A., read a paper on "The Action of a Planet upon Small Bodies Passing Near to it, with Special Reference to the Action of Jupiter upon such Bodies." He showed that when comets came under certain conditions into the neighborhood of Jupiter, it was quite possible that they should under its attraction be constrained to revolve in the system of that planet. This was not possible in the case of the earth, since its much smaller mass would necessitate a very close approach on the part of the comet.

Professor George Forbes, commenting upon the paper, said that he had been studying the motion of comets in the solar system, and had become convinced that the movements of certain of them could only be explained by supposing the existence of a yet undiscovered planet in our system.

Mr. Isaac Roberts, referring to the conjecture of the last speaker, said that during the last winter he had been engaged in carefully photographing that part of the heavens to which Professor Forbes had alluded, and, though he had as yet had no opportunity of examining his plates, he had reason to believe that they would be found to have recorded the position of every star greater than those of the eighteenth magnitude. If, therefore, the planet in question really did exist, he thought it probable that he should be able to demonstrate the fact of its existence.

Mr. W. E. Wilson followed with a paper descriptive of experiments he had made upon the absorption of heat by the solar atmosphere. In these he had made use of Professor Boys' new radio-micrometer, and the curves which he exhibited showed in a very striking manner the variation in radiation from different parts of the sun's disk.

Professor G. E. Hale, Chicago, then contributed a paper, in which he described the results he had obtained from recent photographic investigations of solar prominences and their spectra.

An Irrigating Flume.

The farmers and others east of Fresno, Cal., have united in a project to irrigate a large area of foothill land, on which they will raise oranges. The water will be conveyed from Stevenson Creek, in the Sierras, along Pine Ridge, which itself is twenty miles long, thence to Dry Creek and into the foothills. The water will come down into the foothills by a V-shaped flume, and will convey lumber to the farmers who need it, as well as furnish water for the soil. The flume will be about forty-five miles long, will cost from $125,000 to $150,000, and will prove of great advantage to that region. Work is already progressing on the flume.

Testing a New Smokeless Powder.

Professor Charles E. Munroe, a graduate of Harvard, and recently on duty in the navy at the Newport torpedo station, has produced a new smokeless powder which has been tested at the Naval Ordnance proving grounds, and is said to be eminently satisfactory to the government officials. Eleven rounds were fired from six-pound guns, a charge of 400 grammes giving a velocity of 1,960 feet and a pressure of 16 tons; with a charge of 392 grammes the velocity was 1,920 feet and the pressure 14 tons. With the ordinary service charge of 820 grammes of black powder, the velocity is 1,800 feet and the pressure 15⅓ tons. The results obtained with three-pound guns are said to have been still better, the trials comparing well with anything which has been done in Europe. This new powder is almost entirely smokeless, but it is necessary to use with it a small priming charge of black powder, which causes a slight puff of gray smoke that quickly disappears.

The Regenerative Gas Lamp.

It may be stated as a general rule that any ordinary regenerative lamps may be relied on to increase by at least 150 per cent the light from any given consumption per hour. In practice, one may safely guarantee that equal light will be got from little more than one-third the consumption of flat-flame burners in the usual type of fitting; while, for a given consumption, it is equally safe to count upon almost treble duty from regenerative lamps as against ordinary burners.—*D. Macfie.*

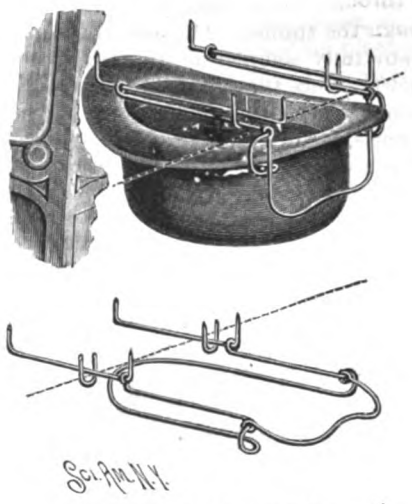
Peach Yellows.

The Hale Brothers, of Connecticut, who are among the largest and most successful growers in the country, have never yet been satisfied that "yellows" is anything more than a symptom of hunger or starvation. They apply potash freely to the soil under all their trees, and thus far have had very little trouble from the disease. If any of their trees begin to look yellow and throw out fine, sickly shoots from the trunk and branches, they apply potash and nitrate of soda; for large trees, ten pounds of the former to five of the latter.

The late P. M. Augur, of Connecticut, was more inclined to look upon yellows as a specific disease due to microscopic germs, and most easily cured by digging out and burning. The study of the disease has been undertaken by the Department of Agriculture, at Washington, and a volume of 250 pages published on the subject, but at that time (1888) no definite conclusions had been reached, although the author, Prof. E. F. Smith, said that experiments pointed strongly to some *contagium vivum* as the cause of the disease. The peach is a comparatively short-lived tree at best, and uncertain in our climate, and the only way to get fruit is to plant frequently, fertilize liberally with suitable material, shorten in surplus growth annually, thin the fruit boldly in bearing years, and avoid forcing a late growth in autumn.—*N. E. Farmer.*

A SIMPLE FORM OF HAT HOLDER.

The illustration represents an inexpensive device to be attached to the bottoms of pews, theater chairs, etc., to conveniently and safely hold an ordinary hat where it will be out of the way, under the seat or against the back of the pew or chair immediately in front of its owner. It has been patented by Mr. Le Roy C. Godwin, corner of High and Chestnut Streets, Portsmouth, Va. Two parallel guide rods, having upwardly bent and pointed ends, are driven into the bottom of the seat, into which also staples are driven

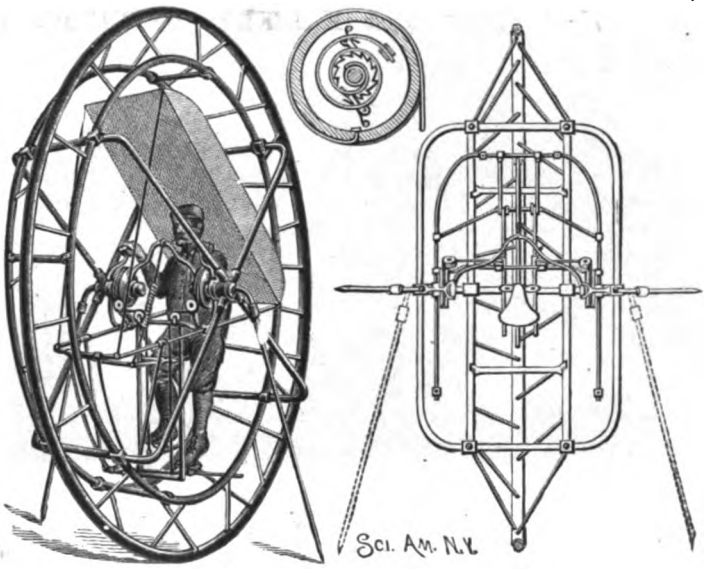


GODWIN'S HAT HOLDER.

to form a fixed loop below the outer portion of each rod. The two ends of a hat-supporting loop formed of a single piece of bent wire are loosely attached by eyes to the guide rods, parallel side rods of the loop extending from the eyes to a forward bent portion where the wire is doubled to extend backward beneath the side rods, its central portion being curved at sufficient distance back to receive the crown of the hat. A bail is secured to the loop near its forward bent portion, and the loop is drawn out, as shown in the outline figure, when a hat is to be placed in it, the loop then sliding by its eyes on the guide rods, and being supported by the staples when pushed back, while the turned-down bail locks the hat in place, as shown in the perspective view. To support the hat against the back of a seat, a light spring catch is placed in position to engage the bail when the loop is turned upward, the eyes by which it is attached to the guide rods permitting it to be also swung, and thus hold the hat in either position.

A SINGLE WHEEL RIDING MACHINE.

The machine shown in the illustration is designed to be easily and safely propelled by the rider, and normally held in upright position when at rest. It has been patented by Mr. Henry C. Ross, of Ipava, Ill. From the rim of the large single wheel short diverging spokes extend to inner parallel rims some distance apart, bent arms attached to the latter rims extending to a hub on each side of the wheel, the hub consisting of a sleeve provided with ball bearings through which the axle extends. Mounted in ball bearings on each of the sleeves is an arm extending above and below, the upper ends of the arms having handles by which the machine is guided, while their lower ends support a framework having a cross bar to which is secured the seat perch, the frame also affording bearings for an axle on which are pivoted the pedal levers. Loosely mounted in a hollow circular case at each side of the machine, on the inner end of the axle and sleeve, is a ratchet mechanism for driving the wheel, one of the figures showing a sectional view of the ratchet attachment. A strap held in a groove on the face of the ratchet casing extends downward on each side to one of the pedal levers, to which it is secured, and as the pedals are operated the ratchet wheel and sleeve are turned to move the main wheel. To the outer ends of the axles are attached rods long enough to extend to the ground, when the axles are turned into position to bring their points down, and at a convenient point in front of the rider is a curved brake bar, connected with the squared inner ends of the axles, so that by raising the brake bar the axle is turned to throw the points of the rods down into the ground, as shown in dotted lines in the sectional plan view, and in full lines in the figure in perspective. When the machine is being operated these rods are held out of contact with the ground by a spring extending from the brake bar to the seat perch. A mud guard, preferably of perforated or wire cloth, is supported by the framework above and back of the seat. The machine is readily steered by the handles on the arms extending upward from the sleeves at each side.



ROSS' UNICYCLE.

THERE is no way to bend wood better than by steaming.

Rabies.

At the recent International Congress of Hygiene, London, in section 3, which dealt with the relations of the diseases of animals to those of man, this was one of the principal topics. The first paper on the subject was read by Dr. E. Roux, of the Pasteur Institute. In this he described how the virus is made by inoculating rabbits with the virus, drying the spinal marrow from such rabbits, and using this in inoculations, commencing with marrow fourteen days old, when it has lost much of its virulence, and continuing with marrow thirteen and twelve days old to those of less than a day old, when it is very active. Dogs so treated do not take the disease. In the case of man, the same method is applied to the prevention of rabies in man after the infliction of the bite. From 1885 to 1891, 9,465 persons have been treated at the Pasteur Institute. Of these, 90 have succumbed in spite of the treatment, which gives a mortality of 0·95 per cent.

Dr. George Fleming, C.B., the veterinarian, followed with a long paper on the propagation and prevention of the disease. This contained valuable information regarding the prevalence of rabies in England and Continental countries. In England the numbers of cases for the last four years in dogs, cattle, sheep, swine, horses, and deer are: 1887, 497 (deer 257); 1888, 176; 1889, 340; and 1890, 134. Except in 1887, an unusual year, dogs form about 90 per cent of the rabid animals. Dr. Fleming spoke at considerable length on these suppressive sanitary police measures, which he considered to be all that is necessary to insure the extinction of the disease:

1. Destruction of all dogs which are rabid, or which are suspected of being or becoming rabid.
2. The seizure and, if need be, destruction of all ownerless and wandering dogs.
3. All other dogs to wear a properly constructed and well-fitting muzzle while rabies prevails, and also for a period equal to longest interval of latency after the malady has been suppressed.
4. The imposition of a tax upon all dogs.

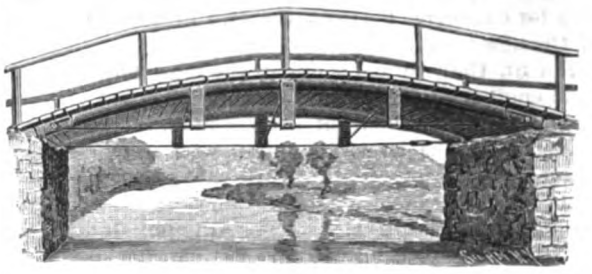
The discussion was mainly in praise of Pasteur, Dr. Hime (Bradford), Dr. Charles Drysdale (London), Dr. Redfern (Belfast), and Dr. Nocard, of Paris, joining in this; but Dr. Elizabeth Blackwell, who had visited the Pasteur Institute, said she saw there dogs in various stages of rabies suffering extreme agonies, and she pointed out that the establishment of a Pasteur institute involves the constant producing of madness in dogs, and in a Christian country there ought to be no question in preferring muzzling as a preventive of the disease. Dr. Roux quietly retaliated that rabbits, not dogs, are used for inoculation. The muzzling proposal received the strongest support from Professor Ostertag, of Berlin, who said that all dogs in that city are muzzled, and a case of hydrophobia has not been known there for ten years. So Germans have no need of a Pasteur institute.

New Torpedo Boat.

On August 25, the official trial took place of a first class torpedo boat for the Victorian government, built by Messrs. Yarrow & Co. The dimensions of the vessel are as follows: Length, 130 ft., beam, 13 ft. 6 in., with a displacement on trial of about 82 tons. She is fitted with triple expansion engines of about 1,100 H. P., and, in fact, is almost exactly identical with the last six first-class boats constructed for the British Admiralty. The speed obtained during a three hours' run was 22½ knots in very boisterous weather, with a load on board representing the whole armament and equipment required for service in actual war. General Stewart was present on behalf of the Victorian government and Messrs. Pledge & Ellis represented the English Admiralty. The seaworthiness and steering capabilities proved very satisfactory, and the speed in spite of the adverse weather was half a knot beyond that contracted for.

AN INEXPENSIVE BOW BRIDGE SILL.

The improved bridge sill whose use is represented in the illustration is designed to partake of the character of both the tubular and truss construction, while representing also the suspension type. It has been patented by Mr. William H. Murphy, of Morgantown, Ind. It consists, essentially, of three parts, a bowed beam, a cable, preferably of steel, passing through or over the beam, and struts interposed, as shown. The beam may be of any desired material, shape, or length, with a groove along its top, in which the cable lies, but is preferably of iron tubing, to receive the cable, and sufficiently flexible to allow of considerable bending, the beam in either case supporting at each end a grooved pulley. The ends of the cable are connected by turnbuckles, one portion passing over the beam or through the tubing, as shown, the other portion being



MURPHY'S BOW BRIDGE SILL.

separated therefrom by short struts interposed between it and the beam, the pulleys allowing for free motion of the cable, according to the load on the bridge, whereby the strain is equalized and principally transferred to the cable, the beam supporting the weight only as end or crushing strain. The cable is lengthened or shortened by the turnbuckles to maintain the desired bow or arch form. One or more of these sills may be placed side by side if desired, and the floor may rest on top of the sills or on floor beams transverse to the length of the bridge, which can thus be built at comparatively small expense, and yet be very light and strong.

Return of the German Arctic Expedition.

A telegram has been received here from Hammerfest announcing the safe return to that port of the German expedition to the Spitzbergen Islands, under the command of Captain Bade. The expedition visited Baeren Island, and proceeding northward followed the west shore of Spitzbergen itself as far as the 80th degree of north latitude, at which point a landing was made and the German flag was hoisted and saluted. It was found impossible to proceed further, on account of the thickness of the ice, so it was resolved to return homeward. All the members of the expedition are reported to be well. The ship and her engines stood all the tests to which they were subjected admirably.

Action of Oils on Metals.

A series of tests, lasting some twelve months, on the action of various oils on metals in contact with them, recently carried out, gave the following results: In the case of iron, seal oil acted the least on it and tallow the most. Bronze was not attacked at all by colza oil, and but very slightly by olive oil. It was, on the other hand, vigorously eroded by linseed oil. In the case of lead, the most deleterious lubricant was whale oil; the best, olive oil. Whale, lard, and sperm oils were about equally erosive. Zinc seemed to be but little attacked by mineral lubricant oils. The best oil was lard, and the worst sperm. Copper was not attacked by any of the mineral oils. Sperm oil had the least and tallow the most action on it. Generally speaking, mineral oil attacked the metals under test the least, and sperm oil attacked them the most. In conducting the experiments, the metals were first thoroughly cleaned in ether and then dried. They were next carefully weighed and placed in closed vessels filled with oil, which were kept for a year at a uniform temperature in summer of 80° Fah. and in winter of about 50° Fah.

Borax for Epilepsy.

Dr. Dijoud has tried this remedy in twenty-five cases, and he claims to have entirely cured one, and to have relieved all except six. The duration of the treatment varied from one to seven months, and he was able without inconvenience to carry the dose up to ninety grains a day. This was only possible if a beginning was made with small doses, which were gradually increased; and when the dose exceeded sixty grains daily, he found it advisable to add some glycerine to the water and sirup in which the drug was usually administered. The patients to whom Dr. Dijoud administered borax had been treated unsuccessfully with the bromides.—*Med Record.*

OPENING OF THE ST. CLAIR RIVER RAILWAY TUNNEL BETWEEN THE UNITED STATES AND CANADA.

The festivities which took place at Sarnia, in Canada, and Port Huron, in Michigan, on the 19th inst., in celebration of the opening of the St. Clair river tunnel, mark an event of much interest and importance, as well from a scientific as from an international point of view.

In the methods of construction the great work represents a new departure in engineering science, whereby many noble projects of similar class, in all parts of the world, hitherto regarded as too difficult and costly for execution may now be realized with ease and economy.

Internationally considered, the new tunnel stands as a bond of union and amity between the Dominion of Canada and the United States; it forms an open highway for commerce between the two grandest empires of the new world.

The St. Clair tunnel is one of the most finished and solid engineering structures on this continent. From commencement to end of construction, it has borne evidence of the control of a master mind. Every branch of the work went forward with the utmost harmony, skill and precision. The architect, desginer and builder was Joseph Hobson, of Guelph, Ontario, of whom it may be said, without flattery, he stands in the front rank of the best engineers.

The question of tunneling the St. Clair river was under discussion with the officers of the Grand Trunk Railway for several years, but most of the engineering advice was against the project, on account of the great length of time, the immense costs and extraordinary difficulties attending the execution of the work. The only exception was Mr. Hobson, who did not share in these gloomy reports and prognostications. Mr. Hobson's plans were at first disregarded, but on closer examination were sanctioned by the directors and he was placed in absolute charge of the construction. His knowledge of the Beach tunneling shield as used in tunneling under Broadway in this city in 1869–70 satisfied him that similar machines, of greater dimensions, would enable him to execute the proposed work rapidly and economically.

In this he was not disappointed. He designed and constructed two gigantic shields of metal on substantially the same plan as the Beach shield. He employed for the production of the hydraulic work the same makers who had fitted up the Beach shield, and who knew exactly what was wanted, namely, Messrs. Watson & Stillman, of this city, who enjoy a wide reputation for strong and excellent workmanship.

Mr. Hobson's shields were each 21 feet 7 inches in

CHIEF ENGINEER HOBSON BREAKING THROUGH FROM CANADA TO THE UNITED STATES UNDER THE ST. CLAIR RIVER.

diameter and 16 feet long, of plate steel 1 inch thick. To design and construct for the first time two such giant machines, to set them in place, and put them in successful operation under the river, was in itself an undertaking which evinces superior judgment and accurate skill. But Mr. Hobson was equal to every emergency, and his success shows that he foresaw all the requirements of his novel proceeding. In conjunction with the Beach shield he brought to his aid the admirable system of using compressed air in tunnel work, the invention of Mr. Dewitt C. Haskin, of this city, who first used it in the Hudson River tunnel. This air pressure system is a necessity in helping to uphold the soft earth of the tunnel heading.

The St. Clair Tunnel Company was formed in the year 1886. Work upon the great cuttings was begun in January, 1889.

Work upon the tunnel portion was begun in August, 1889, and in one year, to wit, on Monday, August 25, 1890, Mr. Hobson enjoyed the supreme satisfaction of breaking through the headings, being the first man to pass through the tunnel. The last stones on the portals, thereby fully completing the tunnels, were laid Dec. 24, 1890. Since that time a great amount of work has been done in preparing and finishing the approaches to the tunnels, a work of great difficulty, owing to the treacherous and slippery nature of the ground.

Referring to our engravings: On the first page the upper sketch shows the approach to the great tunnel at Sarnia, on the Canadian side of the river, with the inaugural train advancing to enter the tunnel. This train was composed of splendid cars, occupied by Sir Henry Tyler, president, with the directors of the Grand Trunk Railway and many distinguished guests. Near the head of the approach to the tunnel Sir Henry was presented with an address by the Sarnia council, after which the inaugural train, amid the cheers and rejoicings of the people, steamed down the incline into the tunnel and disappeared from view under the depths of the St. Clair river, emerging therefrom in Port Huron, Michigan, where an address was presented to Sir Henry from the council of that town. At a later hour a grand banquet was given in Sarnia, when several eloquent speeches were delivered. Such, in brief, were the ceremonies attendant upon the formal opening to public traffic of this new roadway between Canada and the United States. Our lower engraving, first page, shows a bird's eye view of the St. Clair river and adjacent country, with the approach on the Sarnia side. The dotted line indicates the course of the tunnel under the river.

The approaches and portals to the tunnel are much the same on both sides of the river. One of our views, taken from the roof of the Sarnia portal, will give some idea of the magnitude of the cuttings required to complete the approaches.

The walls of the tunnel are composed of segmental

THE GREAT RAILWAY TUNNEL UNDER THE ST. CLAIR RIVER, BETWEEN THE UNITED STATES AND CANADA—THE MEETING OF THE SHIELDS.

flanged iron plates, connected by bolts. One of the plates is shown in our engraving. Thirteen of these plates and a key compose a ring of the tunnel. The lower half of the tunnel is lined with massive brickwork. The tunnel is ventilated by means of two tubes, 20 inches in diameter, arranged in the roof of the tunnel, as shown in our engraving. These tubes extend to the center of the tunnel and pass to the entrances, thence underground to a side building, where they connect with two large Root blowers, by which the required ventilation is obtained.

On page 196 we give sectional elevations, showing the interior of the tunnel and the meeting place of the great shields, by means of which the work was excavated.

The tunnel is 6,050 ft. in length from cutting to cutting, and is divided as follows: From the American cutting to the river edge, 1,800 ft.; from the Canadian cutting to the river edge, 1,950 ft.; and distance across the St. Clair River, 2,300 ft.

The original estimate of cost was $3,000,000. But it is understood the actual expenditure will be less than this amount.

In the construction of the St. Clair River tunnel, two deep cuttings were made, one on each side of the river; that on the American side had a depth of 53 feet, and that on the Canadian side 58 feet deep. Upon the floor of each cutting, against the head thereof, one of the great shields was placed, and the work of tunneling began.

Each shield was circular, 21 feet 7 inches in diameter, 16 feet long, and is built of plate steel, one inch thick, divided into twelve compartments by means of two horizontal and three vertical stays.

The front or heading end of each shield was made with sharp cutting edges. Arranged around against the walls of the rear end of the shield were twenty-four hydraulic rams, each eight inches in diameter and a stroke of 24 inches. By their means the shield was forced forward enough to admit of the building up of a section of tunnel rings within the shield. The power supplied by a Worthington pump was capable of producing a pressure of 5,000 pounds per square inch, or 3,000 tons on the 24 rams. The greatest pressure used was 1,700 pounds per square inch, which is 40 tons per ram and 1,060 tons on the shield.

Each ram had a separate stop cock, so that its pressure could be let on or shut off at will. Thus all of the rams could be operated simultaneously or a portion of them, or singly as required. Thus by letting on or shutting off pressure the shield could be guided and directed in any direction desired, up, down, or laterally, and made to traverse the exact grade required.

The shields weighed eighty tons each, and were built from the designs of Mr. Hobson, by the Tool Manfacturing Company, of Hamilton, Canada, the hydraulic work being supplied, as before stated, by Watson & Stillman, of this city. This form of hydraulic shield is the invention of Mr. Alfred E. Beach, one of the editors and proprietors of the SCIENTIFIC AMERICAN, and was first made and used by him in 1868-69, in constructing a section of railway tunnel under Broadway, New York. The invention was subsequently copied by Greathead and used by him in London in 1886-89, in constructing the two subway tunnels, each three miles in length, from the Monument, passing under the Thames River, Kennington Park Road, etc., to Clapham. The cars in these tunnels are worked by electricity. The Beach hydraulic shield is also now being used in the Hudson River tunnel, in process of construction under the Hudson River between New York and Jersey City.

Joseph Hobson, the chief engineer who planned and built the St. Clair tunnel, is a native of Guelph, Ontario, born March 4, 1834. He served an engineer apprenticeship at Toronto, was engaged in private practice as civil engineer, was for several years employed on location and construction of railways in the United States, Ontario, Nova Scotia. He was resident engineer of the International Bridge, Buffalo. In 1873 he took a position as chief assistant engineer of the Great Western Railway. He was appointed chief two years later, and still holds that office. He is a member of the Institute of Civil Engineers, England, of the American Society of Civil Engineers, of the Canadian Institute of Civil Engineers. He is a tireless worker. In person he is fine looking, six feet high, full gray beard and mustache, bright and genial. Mr. Hobson's efforts in the St. Clair tunnel were from first to last heartily seconded by Sir Henry Tyler, president of the Grand Trunk Railway, who is himself an engineer of rare ability. Further illustrations and particulars of the St. Clair tunnel may be found in the SCIENTIFIC AMERICAN for August 9, 1890, and September 13, 1890.

PROFESSOR THURSTON says: "The assumption seems fair that the locomotive engine will have been superseded when we double our speeds, and that we must find ways to utilize the weights of the cars themselves for adhesion and to make each to carry its own motor."

New Process for Toning Blue Prints.

W. P. JENNEY, E.M., PH.D.

The intense blue color of the ordinary blue print gives unnatural effects in prints from photographic negatives; also in architectural drawings where views and elevations of buildings are reproduced. The following method of toning such blue prints has been found to be easy of application and to give tones varying from a brilliant blue through violet blue to neutral tint and warm shades of gray, according to the intensity of the action of the bath.

The paper employed may be common blue print paper, sold ready for use in rolls, or the specially made paper sold in packages of cut sheets by the dealers in photographic supplies. The solar printing is carried out in the usual manner. The best results are obtained with dark prints, as the intensity of the color is somewhat reduced by the toning process. The following baths are employed:

BATH A.

Muriatic (hydrochloric) acid	3 to 4 drops.
Water	16 oz. (1 pint).

BATH B.

Aqua ammonia	5 to 10 drops.
Water	16 oz. (1 pint).

BATH C.

	Apoth. weight.
Alum	2 oz.
Tannic acid	1 drachm.
Water	16 oz. (1 pint).

The prints are immersed face downward in bath A until all the soluble salts contained in the paper are dissolved and removed, then dipped into bath B until the negative turns a violet blue and the whites are clear, care being taken that the immersion in the ammonia be not continued too long, as the definition of the picture may be injured. The prints are transferred from the ammonia bath, placed face upward in a tray filled with bath C, and exposed to bright sunshine for from 5 to 10 minutes, until no increase in the strength of the picture can be noticed. The pictures are finished by toning in bath B until the desired shade of color is obtained, the picture becoming first a brilliant blue, then violet, and finally, by prolonged action, bluish gray or neutral tint. The toning may be varied by a second immersion in the tannic acid bath C, followed by a second toning in bath B. After toning, the prints are dried in the sunlight in the usual manner.

The above process is specially applicable to prints from photographic negatives, enabling the amateur in the field, provided with a printing frame, some sheets of prepared blue print paper, and the above easily procured chemicals, to test the printing quality of his negatives with results only slightly inferior in detail and definition to those obtained by the complicated process of silver printing.

The Proposed Tubular Railway under the Channel between England and France.

Sir Edward J. Reed, at the late meeting of the British Association, Cardiff, read a paper on "The Channel Tubular Railway." Among the earlier railroad proposals were several, he said, for constructing metallic tubes upon the bed of the channel. The sea in the channel is everywhere of very moderate depth, and where the bottom is not practically level, its departures from the level are surprisingly small and gradual. The depth of the channel nowhere reaches 200 feet upon the selected line from England to France. For several miles out from the English coast it is not 100 feet deep; and the greatest depth is, roughly speaking, about two-thirds of the way across to France, and there its maximum is 186 feet. A railway across this piece of submarine ground is as good as any other railway. The fact that it is a railroad within a perfectly watertight and durable tube—or a pair of tubes, for there would be a tube for each line of railroad—completely renders the presence of the sea water outside of it of no consequence. The securing of these tubes in place, and the ventilation of them, led on to the details of the system. The necessity which enforces the use of water tight tubes for the purpose is attended incidentally by great advantages. The author stated that the tubes would be "of iron or steel in so far as the primary and essential elements of their structure are concerned; and this at once, and obviously, relieves us almost entirely, if not altogether, of the cost, the difficulty, the delay, and the danger of doing our construction work at the bottom of the sea. These tubes can be perfectly well built by our shipbuilders and engineers, and partly by those of France, just as ships are built, but with much greater economy. The tubes thus made will be towed by steamers from the building ports to the channel as they are required for being laid in place, and the operation of laying them is one which has been very carefully studied and worked out in order to make it safe and certain. To this end had been devised the system of making the length of tube which has last been laid the means and the instrument of bringing the next length into its position with unerring accuracy. It is difficult to explain in words alone the operation of laying the tubes. But, obviously, if one end only of a buoyant tube is forcibly taken down from the surface of the water to the bottom, or nearly to the bottom, the other end will float and rise somewhat above the surface. This being so, a pier wholly afloat at the time is brought up to the emerged end of the tube, and coupled up to it by enormous hinge joints. The next length of floating tube is then brought up to the other side of the floating pier, and similarly jointed to it. The pier is now sunk by suitable means and under proper control, and as it goes down carries with it the second end—so to speak—of the first named tube, and the first end of the last named tube. The other end of this latter tube floats, of course, and the operation is repeated. In this manner tube after tube is laid, with piers between the successive lengths, until the whole is accomplished. The lines of railway, of course, pass continuously through the piers as well as the tubes. The whole operation is like the paying out of a huge cable, link by link; tubes and piers alike forming, as it were, the links of the cable. The approximate cost will be between 12 and 15 millions sterling."

The author then dealt with the question of national security, which many suppose the channel tunnel to infringe. In the case of the channel tunnel, were that carried out, it would undoubtedly afford a subterranean military road, which, were it once secured by an enemy, might, in the opinion of many, be held in spite of us, because this subterranean road, being deeply situated below the channel bed, would be completely preserved from attack by the British navy. The channel tubular railway, on the contrary, is everywhere situated above the bed of the channel, and could, therefore, be attacked at every point by dynamite. At the same time, it is so constructed and brought up along the foreshore—at a gradient of 1 in 80—as to be exposed for a length of no less than 8,160 feet to the direct fire of the guns of ships between the high water and low water limit. Any breach or hole made in it below high water mark would, of course, admit the sea at the next tide to the whole interior of the tube. The trains in each tube will always pass through it in the same direction. The trains themselves will, consequently, act to some extent as ventilating pistons, forcing air out at one end of the tube and drawing it in at the other. By fitting wings to the engines or carriages, and throwing them out when necessary, the train may be made to fit the tube more nearly, so to speak, and thus to add to the efficiency of this source of ventilation. If other ventilation should be thought necessary—which was very doubtful if electric engines were employed—one or more of the piers could be fitted up as a ventilating station, with steam engines, air pumps, etc., the foul air of the tubes being forced into suitable chambers, and thence by non-return valves into the sea.

Two Cylinders in One.

A new departure in compounding locomotives, which is almost as radical as the idea of compounding itself was, has been put into practical and successful operation by F. W. Johnstone, superintendent of the motive power of the Mexican Central Railway. Coal costs about $11 per ton on the Mexican Central, and Mr. Johnstone undertook to reduce fuel consumption by the introduction of a compound system of his own, in which the high-pressure cylinder is encircled by the low-pressure cylinder.

The high-pressure cylinder is 14 inches in diameter, and the low-pressure cylinder has a diameter of 30¾ inches, which is equal to a cylinder 24½ inches in diameter. The stroke is 24 inches, and the two rods of the low-pressure piston are coupled with the single high-pressure rod to one crosshead. In a competitive test of 12 trips with a single engine, the compound locomotive showed economy in fuel of about 25 per cent, which means a great deal on a road where the fuel account is the largest item of operating expenses, being 22 per cent of the total.—*Chicago Journal of Commerce.*

One Hundred and Eight Years Old.

Mr. Jacob Steel died at a small town near Pittsburg, Pa., on August 24. He was born in Fayette County, in that State, on October 19, 1783, and would, consequently, have been one hundred and eight years old had he lived eight weeks longer. He used to say that he remembered distinctly the day of Washington's second election to the presidency, and his first vote was cast for Jefferson. His habits were simple, he was rather careful in his diet, drank a little whisky occasionally, but never used tobacco. What probably contributed as much as anything else to the prolongation of his life was a cheerful disposition and a remarkable evenness of temper.

Artificial Asphalt.

By heating resin with sulphur to about 250° C., a reaction takes place, attended by the evolution of sulphureted hydrogen, and leading to the formation of an almost black pitchy substance containing sulphur and resembling Syrian asphalt in many of its properties. Thus it is insoluble in alcohol, but dissolves readily in chloroform and benzene, and is sensitive to light in the same way as Syrian asphalt, for which it can be substituted for photographic purposes.

THE LOCOMOTIVE EXPLOSION AT OYSTER BAY, L. I.

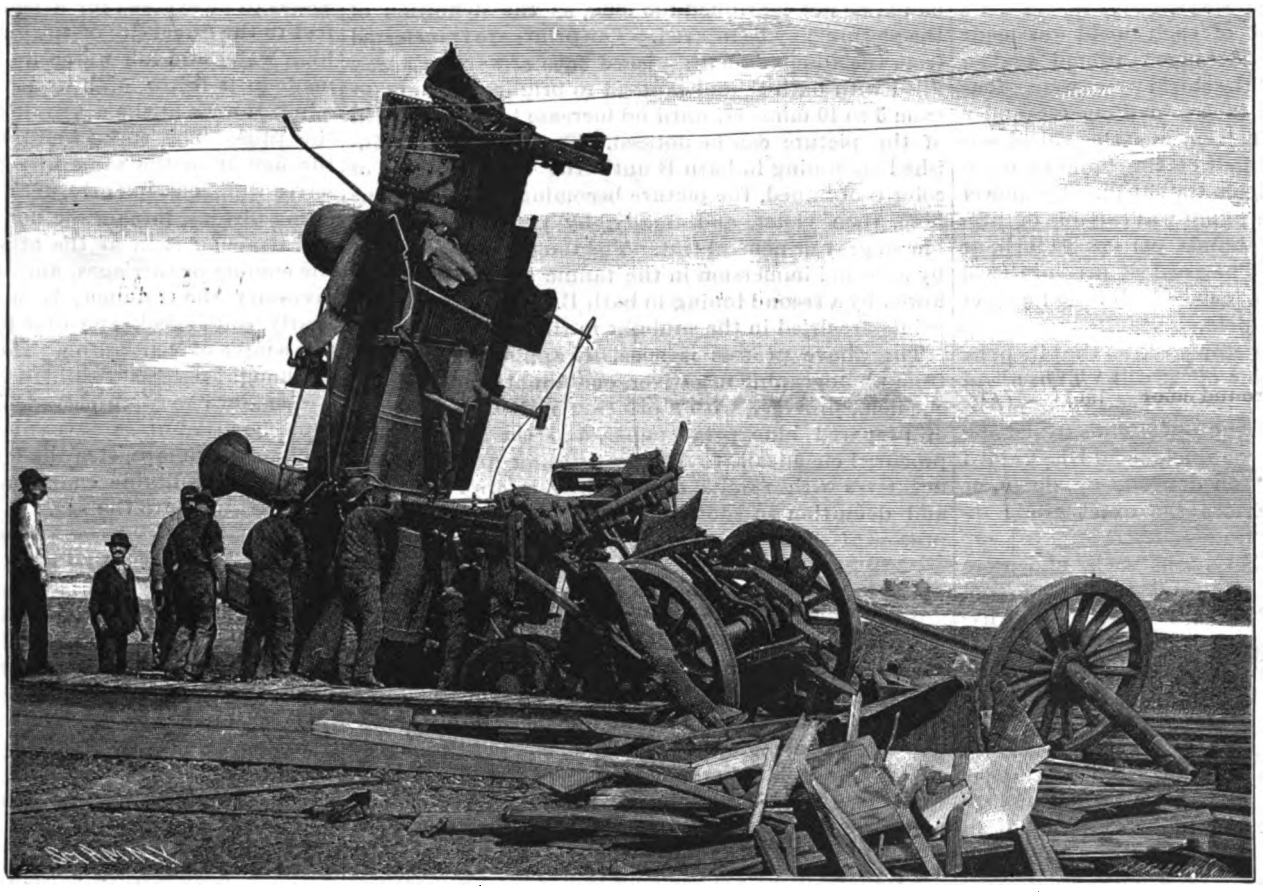
The locomotive explosion noticed briefly in our columns last week forms the subject of the annexed illustration, reproduced from a photograph of the wreck. It will be seen by reference to the engraving that the explosion must have been one of terrific power, as it demolished the rear portion of the engine, drove the drive wheel partially into the ground, tilted the boiler upon one end, and forced the pilot and forward end of the boiler some distance into the earth.

It is supposed that the explosion was due to the weakening of the stays and rivets of the crown sheet, as it was reported that the engineer, who was killed, had intimated to some of his associates that the riveting in the crown sheet and in some of the outer plates of the fire box was defective. If this is true, the present example of the fearful consequences of neglect shows the importance of attending to such defects as soon as they are discovered. Had these imperfections in the boiler been noticed and repaired, the loss of life and the suffering entailed thereby would have been avoided, and a valuable machine would have been saved.

It is reported that the locomotive was built by the Rogers Locomotive Works in 1889. It was one of the 46 tonners intended for the heavy summer traffic, and was run two seasons on the main line. It had been recently thoroughly overhauled, and superintendent of motive power, Charles Thompson, of the Long Island Railway, was unable to offer any explanation of the catastrophe, but the form which the explosion took seemed to indicate that there must have been some foundation for the observations of the engineer, as the crown sheet and fire box were completely detached from the shell of the boiler.

The present accident is a forcible reminder of the responsibilities of the officials whose business it is to know the condition of boilers and engines, and it raises an interesting question, not only in regard to locomotive engines, but as to the condition of thousands of boilers in the basements of our buildings and under the sidewalks over which we pass from day to day.

It is possible that this accident may have been one of the kind whose cause could not have been foreseen, but the reverse is more than probable.



THE LONG ISLAND RAILROAD LOCOMOTIVE EXPLOSION.

Pitch Pine from Seed.

A correspondent writes as follows to the editor of *Garden and Forest:* A large field, worthless for cultivation, almost pure sand, in places a little loamy, is growing up with bayberry, sweet fern and golden rod. Wood seeds of *Pinus rigida* catch here, and if so, how should they be sown, or is there any chance of success in using other tree seeds, and if so, what sorts—either deciduous or evergreen? Expense is very much to be considered. The editor says:

Such land as our correspondent describes will quickly produce a crop of pitch pine (*Pinus rigida*); but it often possesses more plant food than its natural plant covering would indicate, and such land will often grow white pines, oaks and chestnuts of a considerable size and value, as the plantations made in East Greenwich, Rhode Island, by Mr. Henry G. Russell, demonstrate. The best way to plant pitch pine is to sow the seed in the spring with an ordinary seed sower in shallow furrows four or five feet apart each way; but, as the surface of this particular piece of ground is already more or less covered with dwarf shrubs and other plants, it would be cheaper to scatter the seed broadcast over the surface and take the chance of a sufficient number germinating to cover the ground with plants. White pines are best transplanted when ten or twelve inches high. It is a good plan to plant acorns of the white, red and black oaks and chestnuts among young pines, to replace these in case they are destroyed by fire or other causes, or to take their place after the pines are cut. The seeds of such deciduous trees can be quickly and cheaply planted in holes an inch or two deep, made with an ordinary walking stick. The holes, after the seeds have been dropped in, should be covered by a pressure from the foot, which will make the soil compact over them. The seedling oaks and chestnuts will exist for years under the dense shade of the pines, and will grow rapidly as soon as light and air are admitted to them.

Camphor in Phthisis.

Good results are reported from Berlin as attending the use of injections hypodermically of camphorated oil (1 in 10 of olive oil) in the treatment of phthisical patients. Fifteen-minim doses were given, and after a time these were well tolerated, night sweats, irritating cough, and expectoration being diminished in a remarkable manner, even the first dose effecting a very noticeable improvement in the patient's condition. In hæmoptysis the method also proved very useful, patients being enabled to get about again without fear of a recurrence more rapidly than under ordinary methods. The treatment also did good in bronchitis.

The Tupelo and the Sassafras.

Here two most beautiful and much neglected trees, the tupelo and sassafras, are in their own home. A real tupelo cannot be had from a nursery—a nursery bred tree has neither character nor foliage. The only way is to choose in some pasture or upland an orthodox looking tupelo, not over large—one that has decidedly a look and way of its own—and then, with a long bladed narrow post spade, to cut a circle round the tree, severing every root on the way, and to drive the spade through under the tree, dividing the down-going roots as well. Wait a year, and then in the spring move your tree. Let the new hole be dug four feet deep, even though the same soil is replaced; fertilize it liberally, for which purpose wood ashes are excellent; and by and by you will have a tree of some interesting and beautiful shape, covered with more leaves than can be found in the same space on any tree, each leaf as rich in color and lustrous as that of an English holly, and the whole tree in autumn a jewel of deep and brilliant color.

The sassafras, with the liveliness given by the fresh color and variety in the form and motion of the leaves, is a charming tree all summer; and, as every one knows, its leaves turn with great beauty in the autumn. It may adopt, or be made to adopt, other forms than that of a succession of parasol-like layers of leaves on a slender trunk, which is its natural habit. If cut down close, it will sprout into a bush; suckers will appear on every side until a thicket appears, rising everywhere to the middle, a natural bit of artificial work; or, again, a good-sized stem may be cut five or six feet from the ground, and the tree forced to grow so freely that the branches droop and the whole becomes a pile of charming foliage, and a mass of glowing color later.—*Garden and Forest.*

Paste for Labels.

A good paste is made by soaking flake tragacanth in sufficient cold water that the brush will not sink into the paste when finished. To prevent souring, add to the water 2 grains of hydronaphthol (dissolved in a little alcohol) for each pint, and a few drops of clove oil for scent. To keep away the flies add some oil of pennyroyal. Avoid, in making pastes, oil of wintergreen and carbolic acid, for these produce a purplish discoloration by contact with the tinned iron of the brush.

Disaster to Janssen's Party on Mont Blanc.

An expedition had been organized by M. Janssen, the French astronomer, with a view to searching out, near the summit of Mont Blanc, a solid rocky foundation on which to commence his proposed observatory. Five men had been engaged for a week in driving tunnels, but the weather becoming adverse, and provisions being exhausted, and the feet of one laborer being frostbitten, the order was given on the morning of August 21 to descend to Chamounix. All went well till they reached the Petit Plateau, where the weather got worse and a fog was encountered. This drove them out of their usual course, and just at that time an enormous avalanche was precipitated from the rocks, and striking the party swept five of them into a crevasse.

The party consisted of eleven persons in all; first, five who had been working at the tunnel operations, next Count Favernay, of Paris, with a guide before and behind him, and next to these Count Armand, a guide, then Herr Hermann Rothe, of Brunswick, a landed proprietor, who had been to the top, and lastly the eleventh man, Michel Simond, a well-known guide. These were all roped. The avalanche of enormous blocks of frozen snow and ice, of almost inconceivable size, overwhelmed the whole party, swept the six hinder persons into the crevasse, and Herr Rothe and Guide Simond were seen no more. It is the opinion of all the rest that they must have met with an instantaneous death, for tons and tons of ice in blocks fell upon and must have crushed them instantaneously. As soon as those on the margin of the crevasse could disentangle themselves from the ice in which they were buried up to their necks, they went round to the other side of the crevasse in the endeavor to rescue those in it. Blocks of ice, very sharp, had cut the ropes in two places. At a depth of twenty meters, and in various situations, four persons were found saved from further descent by resting on the blocks of ice which had shattered and entombed the two victims of this catastrophe.

An Enormous Microscope.

The Poeller Physical Optical Institute, of Munich, have under construction an enormous microscope for exhibition at Chicago in 1893. It will magnify to 16,000 diameters, or, as ordinarily fitted, to 11,000 diameters. An electric light of 11,000 candle power is to be used for illuminating the image, which is to be projected on a screen. As the heat from this powerful light would derange the focus by expansion of the metal, an ingenious device is used to cool the metal. This is a small copper cylinder filled with liquid carbonic acid under a pressure of 350 pounds to the square inch. It is connected with the microscope in such a manner that an electric regulator automatically opens a valve and allows a drop of the acid to escape in a spray on the metal to be cooled. The liquid immediately evaporates and produces intense cold. The whole cost of the instrument is said to be nearly $10,000.

Frequency of Thunderstorms.

A German periodical gives statistics concerning the frequency of thunderstorms in various regions of the world. Java has thunderstorms on the average 97 days in the year; Sumatra, 86; Hindostan, 56; Borneo, 54; the Gold Coast, 52; Rio de Janeiro, 51; Italy, 38; West Indies, 36; South Guinea, 32; Buenos Ayres, Canada, and Austria, 23; Baden, Wurtemberg, and Hungary, 22; Silesia, Bavaria, and Belgium, 21; Holland, 18; Saxony and Brandenburg, 17; France, Austria, and South Russia, 16; Spain and Portugal, 15; Sweden and Finland, 8; England and the high Swiss mountains, 7; Norway, 4; Cairo, 3. In East Turkestan, as well as in the extreme north, there are almost no thunderstorms. The northern limits of the thunderstorms are Cape Ogle, northern part of North America, Iceland, Novaja Semelja, and the coast of the Siberian ice sea.

USE French polish for taking out scratches on varnished furniture.

NON-VENOMOUS SNAKES.

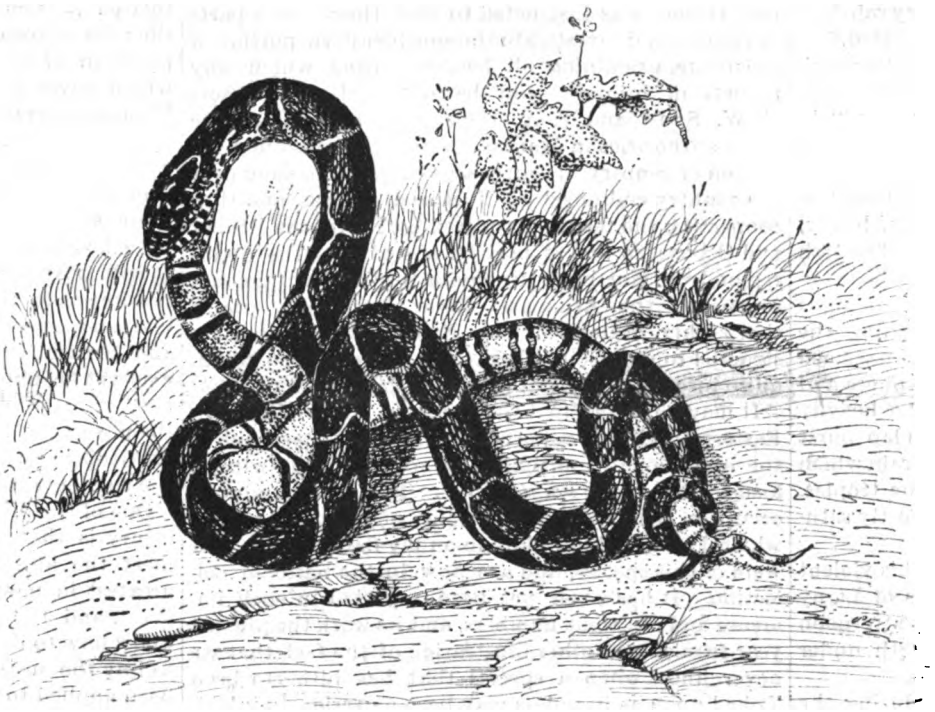
BY C. PEW SEISS.

The following is a plain descriptive list of the non-venomous serpents found in the States from Maine to Delaware and Maryland inclusive, and from the Atlantic coast to Ohio. It embraces 23 species and from 4 to 5 well marked varieties. In this section there are found but three venomous species, viz., two rattlesnakes, one of which is rare, if not exterminated, and the copperhead. Of the non-venomous snakes many are insectivorous and beneficial, while others reduce the number of destructive rodents. But the common water snakes are pests and robbers, and destroy the game fishes of our rivers and lakes by the thousands.

1. Ground snake, *Carphophis amœna.* Body glossy and opalescent; color uniform brown above; beneath salmon color in life, dull yellow in alcoholic specimens. 13 rows of smooth rhomboidal scales across the back. Length of adult from 8½ to 12 inches. Found from Massachusetts to the Gulf States, and westward to Illinois. The Western species is the *C. vermis.* It is generally found hidden in the ground, and is consequently called "worm snake" in some sections.

2. Valeria's snake, *Virginia Valeriæ.* Color yellowish brown above; pale yellow beneath. There are generally minute black dots scattered along the dorsal region, sometimes forming two or more longitudinal rows. The center of each scale is marked with a pale line, which gives the body a somewhat striated appearance. 15 rows of dorsal scales, smooth or very faintly keeled (carinated) on the posterior portion of the body. Length from 8 to 11 inches. Rare north of Delaware and Maryland.

3. Chain snake, king snake, *Ophibolus getulus.* Color deep lustrous black, with 27 to 30 nearly equidistant transverse white or pale yellow bands or rings. These bands are narrow and do not encircle the body, but bifurcate on the sides, so that one portion joins the white band in front and the other unites with the band behind, thus often producing a nearly continuous undulating line on the sides. Sometimes these lines cut the ground color into the form of large somewhat hexagonal black blotches. Beneath, either uniform glossy black or dull yellow, more or less spotted with black. The coloration is not uniform, the ground color being brown in some individuals. The head is black and spotted with pale yellow or white. 21 to 23 rows of smooth dorsal scales. Length from 3 to 5 feet. Found from Long Island, N. Y., and New Jersey southward to Florida and Texas. Has been frequently known to crush and swallow other snakes. The commonly expressed stories that it wages particular warfare against the rattlesnake, so far as I can learn, have not been confirmed. I have heard of instances in the South where it has attacked and killed the moccasin, so there can be no reason why a hungry king snake should be so fastidious as to pass by a fat rattler. My note book says: On the 27th of June, 1879, a female of this species laid 5 eggs. They were white and chalky, of a blunt oblong oval shape, and measured about 1½ inches in length.



CHAIN SNAKE SWALLOWING A SCARLET SNAKE.

4. Scarlet snake, *Ophibolus doliatus.* Scarlet to red brown, in life, with 21 or more pairs of black rings with a yellow band between them. In some varieties these pairs of black rings are parallel and regular, while in others they separate or diverge on the sides and unite with the adjacent black ring of the next pair; thus forming a black border to a large red spot. Beneath, yellowish white, irregularly marked and spotted with black. 19 to 23 rows of smooth dorsal scales. Length 18 to 27 inches. Found in certain localities from Delaware to Kansas and southward to the Gulf of Mexico.

House snake, milk snake, checkered adder, *Ophibotus doliatus*, var. *triangulus.* All the common names are inappropriate, as it neither lives in houses nor drinks milk, and an adder is, strictly speaking, a venomous snake. Ground color, dull white or pale gray to pinkish; a dorsal row of dark brown or red brown spots, bordered with black, and one or two alternating rows of smaller spots on each side. Beneath yellowish white, marked with small subquadrate black spots, giving the abdomen a pretty tesselated appearance. A V or Y shaped spot on the head. 21 rows of smooth dorsal scales. Length 27 to 42 inches, rarely 4 feet. Canada southward to Mississippi and west to Kansas. The young are often bright red in color like the scarlet snake. Very useful on farms as a field mouse destroyer. It will also kill and devour other snakes.

5. Ring-necked snake, *Diadophis punctatus.* Generally dark slate color above, with a small darker spot at the base of each scale; sometimes ash color or brown. The head posteriorly has a yellowish white ring generally bordered with black; sometimes this ring is wanting. The lips are white. Body beneath orange, in life, with two series of small black subtriangular spots; each abdominal plate having two spots, one on each side uniting with the dorsal color. Often there is a third or middle row; and rarely the spots are entirely absent. 15 rows of smooth scales. Length 12 to 15 inches. Canada to Florida and west to Michigan. A pretty and timid little snake; found generally under rotten logs and bark. It feeds upon salamanders, slugs and earthworms.

6. Common green snake, *Cyclophis vernalis.* Color of head, body and tail above, bright grass green (blue in alcohol); lips yellowish white, tinged with green. Beneath pale yellow or pale yellowish green. 15 rows of *smooth* dorsal scales. Length 15 to 20 inches. Found from Nova Scotia to Wyoming and New Mexico. Frequently met with on the ground in grassy valleys, but has been observed also searching among the branches of low plants, for insects.

7. Green bush snake, *Phyllophilophis æstivus.* Entire upper surface brilliant green. Beneath creamy white, or with a tint of pale green. Form slender; tail long and delicate. Scales in 17 rows, *carinated*, or keeled, except the two rows next to the abdominal plates. Length 24 to 34 inches. Found from New Jersey to Kansas (in certain localities), and southward to Florida and Mexico. Most commonly seen gliding about bushes in mountains and hills.

8. Fox snake, *Coluber vulpinus.* Ground color above, yellowish brown; a series of subquadrate chocolate brown dorsal blotches; another lateral row of smaller spots on each side, one spot opposite to each space between the dorsal blotches. Sometimes another row of small spots, resting on the edges of the abdominal plates, either opposite to the dorsal spots or uniting with the second row, and thus forming vertical bands. Beneath, white with a tint of yellow, with alternating subquadrate black spots; generally two spots on each plate. Body robust in form, more so than any of the genus; tail thick, rather short, and subconical. Head rather large, and eyes small. Dorsal scales in twenty-five to twenty-seven rows; fourteen to seventeen rows are carinated, the lower rows smooth. Length, 4 to 5 feet. Found in Ontario, Canada, Massachusetts (Allen), New York, and in several localities west to Nebraska.

9. Corn snake, spotted racer, *Coluber guttatus.* Color above, light reddish brown; somewhat lighter on the sides; along the back is a row of about forty large, dark brick-red spots, bordered with dark brown or black. On the sides are about three irregular rows of small spots, sometimes indistinct. Beneath, white or yellowish, with black squarish spots, irregularly dispersed and of unequal size; two or three close together occur on one side and then on the other. Twenty-seven rows of dorsal scales, about thirteen of the upper rows indistinctly carinated; body, rather slender; tail, small and tapering, about one-sixth the total length. [The tail of a snake is that portion posterior to the anus or vent.] Length, from 3 to 5 feet. Specimens have been taken in Massachusetts and New York (United States National Museum). Found from Virginia to Illinois, and south to the Gulf of Mexico.

10. Pilot black snake, *Coluber obsoletus.* General color above, glossy, coal black; often small white streaks or dashes are seen at intervals between the scales, indicating the boundaries of large spots; sometimes dull red blotches appear along the sides. Beneath, bluish slate color posteriorly; yellowish clouded with slate anteriorly; chin and throat, white or pale yellow. The Southern variety, especially when young, is often pale brown, with a dorsal row of about forty large dark-edged brown spots, separated by narrow light spaces of the ground color, and with rows of alternating spots on the sides (*S. confinis*). Scales generally in twenty-seven rows, carinated above, with about seven rows of smooth scales on the sides. Tail less than one-fifth the total length. Length, when full grown, 5 to over 7 feet. Can easily be distinguished from the common black snake by the keels in the upper dorsal scales. Found from Massachusetts to Texas and Missouri.

11. Black snake or racer, *Bascanium constrictor.* Color above uniform glossy black, beneath bluish slate, chin and throat white, sometimes with few black spots. Westward the color varies from bright blue and leaden blue to olive, while the under parts are more or less yellow (var. *flaviventris*), the blue racer. The young when about a foot and a half in length are dark olive colored, with a row of irregular brown spots, with darker margins along the back, the sides of the body and the abdomen also spotted, the spots becoming indistinct posteriorly, head yellowish, spotted with brown. Scales large, smooth, hexagonal, in 17 rows. Tail about ¼ the total length. Length 4½ to 6 feet. Canada and the United States. The typical black variety is found from Canada south to Texas. This well known snake is of a restless and wandering nature. In the breeding season the old males are often irritable and aggressive. But although they sometimes put on a bold front and slowly approach the intruder, they keep at a safe distance, and retreat when a sudden advance is made. If the intruder should turn and run, the snake will at times give chase, but the moment the runner halts and turns, the snake halts and turns also, and beats a hasty retreat the moment you become the chaser or aggressor. I have no authentic facts of its ever seizing hold of a man, unless an attempt was made to catch or hold it under foot, when I have known it to give the trousers a good shaking. Linné was informed that it entwined itself about the legs of men, and thus threw them to the ground. For this reason he named it constrictor. The black snake is a great and active climber, and will ascend the tallest trees to rob bird's nests, even mounting dead and almost branchless trunks to drag young woodpeckers and squirrels from their holes.

Packing the Stern Gland at Sea.

The New Zealand Shipping Company's steamship Otarama, on her last voyage homeward from the Colonies, lost two of her propeller blades; the two remaining blades being at right angles to each other placed an awkward strain upon the tail shaft, the consequence of which was a tendency to eccentricity and the setting up of great vibration. After a time the packing in the "stern gland" was destroyed, and gradually worked out in small pieces; then the water commenced to make rapid ingress. At this period the ship was off the South American coast. However, something must be done. So after a consultation between the engineers, a most original plan was adopted. Procuring a length of new 2½ manila rope, a loop was passed over one of the remaining propeller blades; then a turn was taken round a deck bollard, and the engines turned round with the steam twining gear; the rope was pulled in toward the "stern tube," and gradually became wound tightly round the shaft at the recess between the propeller boss and the stern frame. The result was that a perfectly tight joint was secured, and the stern gland could be repacked in safety. The plan was found to answer so well that the leakage was almost *nil.*

A New Compressed Air System.

A system of pipes for the transmission of power by compressed air has been recently established at Offenbach. The laying down of the pipes was commenced in November last, and has been carried out in spite of many difficulties. The total length of pipes laid amounted to 7,760 yards, of which 1,702 yards consisted of pipe 1 foot in diameter, 1,710 yards 8 inches in diameter, and 4,347 yards 4 inches in diameter. The pipes were laid about 1½ feet below the footpath. The connections of the pipes were made by means of India rubber, as in the similar installation in Paris. Valves are provided for shutting off the air from separate lengths of pipe. A trial of the system was made by the engineering authorities of the town and by the Boiler Inspection Association, which showed that there was a loss of 0·11 of an atmosphere in 7½ hours—that is, 0·39 of a cubic meter per hour kilometer. This loss amounts to 13 per cent on the daily output, the power transmitted being, on an average, 500 h. p. This result is regarded as very favorable.

Correspondence.

Infusorial Earth and Rubber.

To the Editor of the Scientific American:

Under title of "Fossil Flour," you publish quite a lengthy article in your valuable paper. The use of the same, if the article is correct, is not new, as our Mr. A. B. Jenkins patented, under date of October 5, 1880, the use of diatomaceous silica or infusorial earth, mixed with rubber and gutta-percha, or either, and such other matter as is necessary to vulcanize it. It will not be necessary for us to go into details, as any one interested in the manufacture of rubber compounds can easily procure a copy of the patent wherein the use of silica or infusorial earth is clearly defined for use in different rubber compounds. The article speaks particularly of valve work. We wish to state that the different steam pump manufacturers have used our silica valves for years. JENKINS BROS.

71 John Street, New York, September 10, 1891.

Dust Necessary to Produce Rain.

To the Editor of the Scientific American:

I have read your editorial in the SCIENTIFIC AMERICAN of September 5 on "The Artificial Production of Rain," also an editorial on the same subject reproduced from the SCIENTIFIC AMERICAN of December 20, 1890. The article of the latter date escaped my notice at the time it was published. You say that in a communication from Senator Farwell the following theories are advanced:

"My theory in regard to producing rain by explosives is based partly upon the fact that after all the great battles fought during the century heavy rainfalls have occurred. This is historical and undisputed."

Then follows the descriptions of rainfalls after various battles, extensive fires, and eruptions of volcanoes.

In quoting Siborne, you make him say that "At Waterloo, the weather during the morning of June 17, 1815, had been oppressively hot. It was now a dead calm; not a leaf was stirring, and the atmosphere was close to an intolerable degree, while a dark, heavy, dense cloud impended over the combatants. The 18th Hussars were fully prepared and awaited the command to charge, when brigade guns on the right commenced firing for the purpose of breaking the order of the enemy's advance. The concussion seemed instantly to rebound through the still atmosphere and communicate like an electric spark with the heavily charged mass above. A violent thunder clap burst forth, which was immediately followed by a rain which has never probably been exceeded even in the tropics. In a few moments the ground became perfectly saturated."

As a matter of history, I will state that this violent storm of rain occurred soon after the battles of Ligny and Quatre-Bras, which were fought in the afternoon of June 16. Waterloo was fought on the 18th under disadvantages, on account of previous rains.

"It rained incessantly," says Siborne, "during the night of the 17th, occasionally in torrents, while loud and frequent peals of thunder fell ominously on the ear of the toil-worn soldier." "As the morning (June 18) advanced," continues Siborne, "the dense, vapory masses which had so long rolled slowly and heavily over the plain gradually began, as if relieved by the constant discharge of their contents, to soar into a higher region, where, during the whole day, with little or but imperceptible motion, they hung spread out into a broad, expansive vault, through which the rays of the sun were unable fully to penetrate, until just at the moment of its sinking from the scene of strife, when it shed the full blaze of its setting splendor upon the victorious advance of the Anglo-allied army."

It appears to me that the *cause* of rainfalls after battles is not fully understood by the experimenters who are so deeply interested in producing rain by firing explosives. If our atmosphere were perfectly pure, free from minute particles of matter, it would be a question whether we would have any rain. When the molecules of water condense into fog or rain drops, they first require a nucleus, and that nucleus is the imperceptible dust in the air. The burning of gunpowder, eruptions of volcanoes, and extensive fires increase the particles in the atmosphere, and, therefore, make the conditions more favorable for rain.

Atmospheric dust plays an important role in the economy of nature. It not only produces rain, under favorable conditions, but diffuses light, gives us the red and golden sunset, and the more minute particles of dust or water, the blue sky. H. C. STILLMAN.

Oswego, September 7, 1891.

Successful Trial of the Justin Dynamite Cartridge.

The failures heretofore attendant upon the attempt to fire a shell containing dynamite from the ordinary cannon have not discouraged Dr. Justin, the inventor of a special form of dynamite cartridge, and he made three apparently successful shots on September 10. Two of these shots were fired from a 5-inch Parrott rifle and one from an 8-inch Blakely gun, the range being about half a mile, and the shells striking against a wall of limestone rock. The two 5-inch shells carried forty-one ounces each of nitro-gelatine, seven pounds of powder being used for each charge. Neither of these shells was exploded, and one of them, strange to say, rebounded many feet in the air. The 8-inch shell is said to have contained 150 pounds of nitro-gelatine, and to have been fired from the gun with a powder charge of thirty pounds. It exploded on striking, bringing down great quantities of rock and bowlders.

The Locust or Grasshopper Outlook.

BY C. V. RILEY.

During the past summer, and especially during the last six weeks, the papers have contained numerous reports concerning serious grasshopper ravages in various parts of the country, in some cases the reports being quite sensational and well calculated to create apprehension as to the safety of our crops and as to the possibility of serious locust devastation this fall or next year. I have felt that perhaps a few words indicating the exact state of the case and summarizing the investigations made, whether by agents of the department or others, will be of service in giving our farmers the true condition of things. While, from the investigations made a year ago and the reports of locust injury, it did not seem probable that there could be very much foundation for the reports of the present year, I deemed it quite desirable to endeavor to ascertain the facts as closely as possible. Accordingly Professor Lawrence Bruner was instructed to examine fully the regions in the Northwestern States where the injuries were reported, and he has been over Eastern Colorado, Eastern and North Dakota, Western Minnesota and portions of Montana and Wyoming. Professor Herbert Osborn was instructed to visit the western parts of Kansas and investigate the southwestern portion of the State, examining all localities from which any reports of injury could be obtained. Professors F. W. Snow and E. A. Popenoe, on behalf of the State authorities in Kansas, thoroughly examined the section of country in southeast Colorado, passing over the country embraced in Northern Kansas, and thus connecting the territory covered by Professors Bruner and Osborn, so that it may be stated that the plains region from Northern Minnesota west to Montana and south to the Arkansas River has been pretty thoroughly examined. Mr. Nathan Banks was instructed to visit South Texas and New Mexico to inquire into the reports of injury in those sections.

It may be stated in brief that the depredations in Eastern and Southeastern Colorado have been due to the exceptional multiplication of the long-winged locust (*Dissosteira longipennis*). This species always occurs in that section, and some of the first insects which I collected in Colorado on my first visit in 1867 were of this species, and are now in the national collection. It has never yet been reported in such immense and injurious numbers, and its work the present year furnishes another illustration of the fact that we never know when a species that has hitherto been looked upon as harmless may become seriously injurious to agriculture. During the latter part of July millions of pupæ and full grown larvæ of this species were found ranging over large areas of Eastern and Southeastern Colorado, moving in vast bodies all the way from Akron to the Arkansas River to the south. The insects moved in a body in various directions, choosing, as Professor Bruner reports, the roads for their line of march rather than the prairies. Normally this species frequents partially bare hill slopes and plains where the grasses are scant, and Professor Bruner's view of the matter is that the past few years have been favorable to its excessive multiplication, but that during the present year the exceptionally heavy rains which have occurred in that region have caused an unusually abundant growth of grasses and other vegetation, and the locusts have been compelled to move in search of more open country, and have frequented the roads, upon which they congregated and which they followed in vast bodies. He found, in going some distance away from the roadways, where the vegetation was at all rank, that but few insects were found. This species, in size and length of wing, much more closely resembles the migratory and destructive species of Europe and some other countries than does the Rocky Mountain locust (*Caloptenus spretus*), and there seems to be no particular reason why, at times, it should not become destructive and fly in vast swarms from one locality to another. So far as past experience justifies calculation, however, it will not do so, and I think there is little reason to fear any continued and widespread injury from this species. It is worthy of note also that its concentration in injurious swarms is due to conditions the very opposite of those which favor the undue increase of our most-to-be-dreaded species (*Caloptenus spretus*).

The locusts found further north have consisted of several species, most of which are known as sedentary, that is, not ordinarily migratory. But one of them, namely, the pellucidilocust (*Camnula pellucida*), is the species that has already done much damage and is one of the Pacific migratory forms. Commencing in Idaho it has been gradually working eastward and is now found in portions of Montana, North Dakota, Wyoming and Western Nebraska. The gradual eastward spread and increase of this species deserves attention, but so far as the reports go, it has nowhere been sufficiently numerous to justify alarm.

The true Rocky Mountain locust, the species which we most have to fear (*Caloptenus spretus*), was found in considerable numbers in North Dakota and Minnesota, in some counties proving quite destructive; but owing to vigorous measures which have been adopted, especially in Minnesota, by the State authorities, chiefly under the direction of Professor Otto Lugger, of the Minnesota experiment station, they have been to a large extent destroyed, and there is little probability that they will spread extensively from the localities in which they now occur. The destructive species most commonly found in Southwest Kansas was the differential locust (*Caloptenus differentialis*). It has devastated the alfalfa fields in the irrigated territory along the Arkansas River for a distance of some fifty miles. This is a widespread species east of the Rocky Mountains, occurring all over the country, and it is one of the species which acquires the power of extended flight only in very dry seasons and under certain favorable conditions. Ordinarily the female is too heavy bodied and short winged to become migratory. There is no fear of widespread injury from this species. The accounts from Southwest Texas have been very greatly exaggerated, and little injury could be found by the agent sent there. The species were also those indigenous to the region, and not of migratory forms that had come from other parts. The reports from Ohio and from some of the other Eastern States, though not investigated particularly, need not concern us, because they are known to be based upon the undue multiplication of some of the indigenous Eastern species which never acquire the destructive powers of the Western migratory forms.

On the whole, therefore, it is safe to conclude that, while there are several localities where locusts have been more or less destructive and required attention, there is no cause for widespread alarm and no reason to believe that any general injury will result in 1892. It will, however, be desirable to gather all the data possible as to the regions where eggs will be thickly laid, and especially to get further data from Manitoba and British North America. These data it is hoped may yet be obtained through the Canadian authorities, or possibly by some mutual arrangement with them, so that if it should be necessary to urge any particular action on Congress, it may be done during the coming winter.

One of the difficulties in sudden outbreaks of locust injury is that they find the farmers ill prepared to meet the attack. These injuries are almost always greatest in newly and thinly settled portions of the West, and the farmers, as a rule, even where they know how to deal with the insects, have not the means to buy the necessary supplies. The department has been applied to the present year for material assistance in the way of coal oil and sheet iron, but has no way of furnishing such material aid, which must be had of the State authorities where the emergency requires.

Cleaning Panama Hats.

To renovate white straw hats the following method has been recommended. Prepare two solutions as given—

No. 1.

Sodium hyposulphite	G. 10
Glycerine	" 5
Alcohol	" 10
Water	" 75

No. 2.

Citric acid	G. 2
Alcohol	" 10
Water	" 90

First sponge the straw hat with solution No. 1, and lay aside in a moist room (cellar) for twenty-four hours; then apply solution No. 2 and treat similarly as before. Finally the hat should be gone over with a flatiron, not too hot. If very dirty, the hat must be cleaned with some detergent and dried before beginning the bleaching operation.—*Western Druggist.*

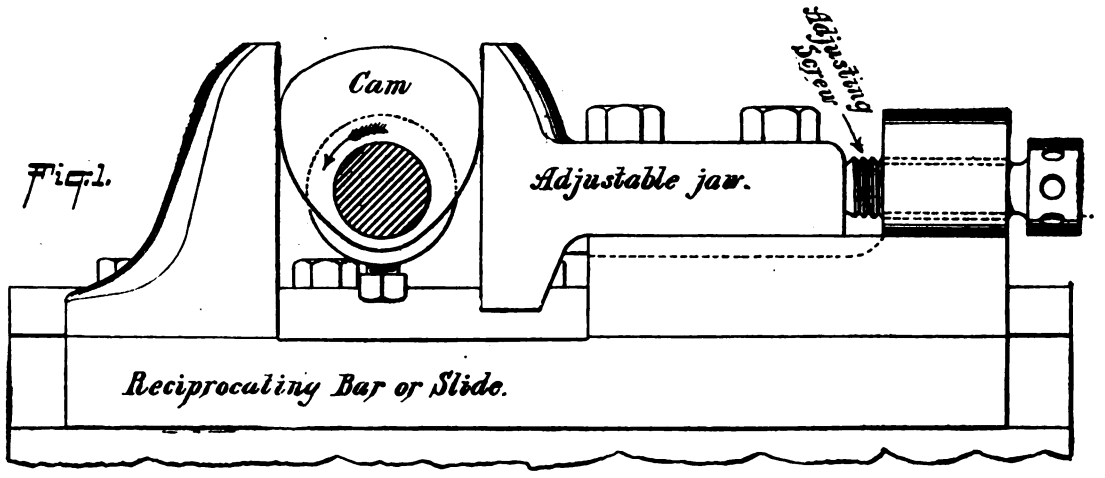
Disappearing Lampposts.

An ingenious suggestion has been made to the Brussels authorities with regard to the electric lighting of their principal streets, and particularly of the Grand Place, in which the Hotel de Ville is situated. It has hitherto been objected to the plans for the electrical illumination of this square that the poles on which the lights were hung, and all proposed improvements in the lamps, were out of harmony with the surrounding architecture, which is of an exceedingly interesting character (many of the buildings being in the old style), and were apt to be an eyesore in the daytime. It is now proposed that the light shall be shed upon the square from tall steel standards which will be sunk in deep sheaths underground in daylight and elevated by hydraulic pressure at dusk. Prizes of $200 and $100 are offered for the best design of lamppost.

ONE KIND OF CAM.

BY A. D. PENTZ.

In modern designing many kinds of movement are desired. The experience of one person familiarizes him with one class of motions and the means by which such motions are got, and another person's line leads him to a knowledge of other classes of movement and their data. The kind of cam here demonstrated is probably the most useful irregular but positive mechanical motive, embracing as it does the eccentric cylinder, that is used in practice.



The use of this cam gives a reciprocating motion that has these peculiarities: A positive action, a rest at the ends of the strokes, which rest may be varied to suit the designer from 0° indefinitely, a quiet and smooth motion, a strong and lasting means to modify movement, and one having the capability of being adjusted for lost motion. This cam may either reciprocate a bar or slide (Fig. 1).

It may oscillate a lever (Fig. 2).

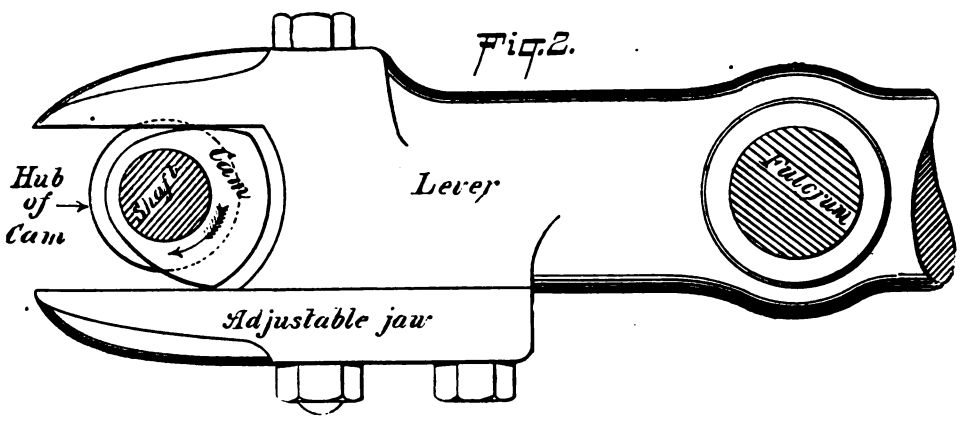
Or it may produce four motions within a quadrangle that is a part of a compound slide or rod (Fig. 3).

If this quadrangle were in the upper of two slides which are arranged at right angles and in horizontal relations to each other, then this cam would, in revolution, produce the same four motions in every part of the upper slide which the point, A, indicates in Fig. 3.

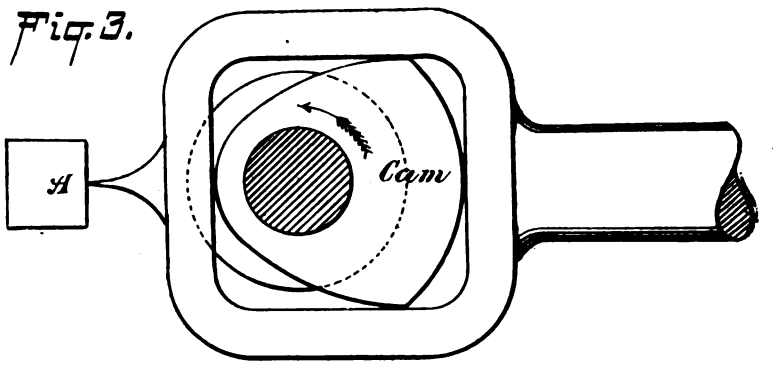
This cam, if the angle of rest be 90°, may be the bearing part of a drilling spindle which will produce a square hole (Fig. 4).

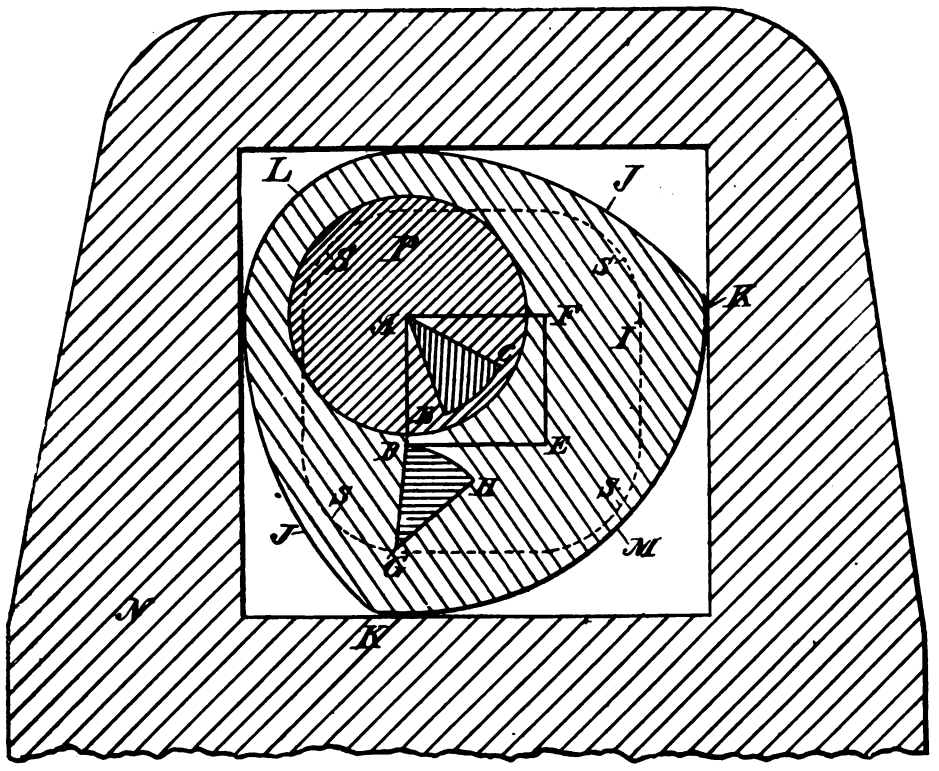
The section, N, is a part of the frame of a drill press. The eccentric cam, O, is fitted to the square mortise in N, and fits the mortise at four points, whatever part of the revolution it may be at. The mortise in N should be deep enough to control and guide the cam, O, without lost motion. The cam, O, may or may not have the interior spindle, P.

Then, if a tool be placed within the angle, B, A, C, and the cam, O, be revolved, the point, A, will describe the square, A, D, E, F, but if the arc, M, be less than 90°, the corners, A, D, E, F, will be proportionately rounded. The tool in B, A, C should not exceed 45° angle at its edge, which shall be exactly at A, which is the center from which the arcs, M and L, are described. Now the arcs, J and K, are described from the centers, G and I, and inasmuch as M and L are each 90°, J and K together on one side cannot be more than 90°, and because J has no more length of arc in degrees than K, but the same precisely, then J and K each are 45° of arc. Now if at the center, G, there be placed a tool whose edge shall be at the point, G, that edge will describe, not a square, but one-half a square, the corners being curved as shown at S. Therefore there can be but one size of square hole made by one shape of cam, in a given mortise, but there may be many cams made to fit this mortise, each of which may make a different size of square hole.

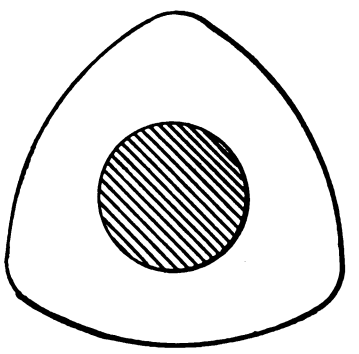


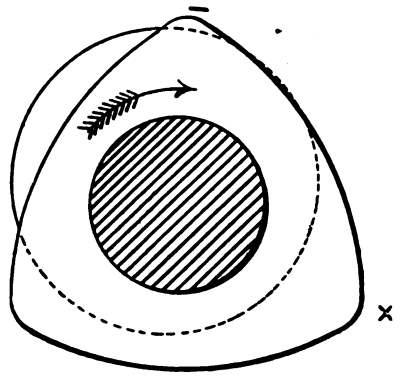
The four motions produced by the cam and described by the point A. It is supposed that the rod B is pivoted at an infinite distance, otherwise the outlines described by A were angles and curves.





A cam, if constructed thus (Fig. 5) and mounted concentric to its mean center, will force a lever, or a slide or slides, or a rod, to reciprocate three times in each direction every time the shaft revolves the cam, but there will be no distinct rests at the ends of strokes. If this cam, then, should be placed on the shafts in either Figs. 1, 2, or 3, it would, if it fitted the devices there shown, act similar to what a regular eccentric would do, should such eccentric be revolved three times as fast as this cam is revolved.





If again this cam be mounted eccentric to its mean center and at the same time at unequal distances from each of the three centers of construction, then if it were placed in the devices in Figs. 1, 2, 3, there still would be three reciprocating motions in each revolution, but each of the three would be thrown to a different distance. The cam would then be as in Fig. 6.

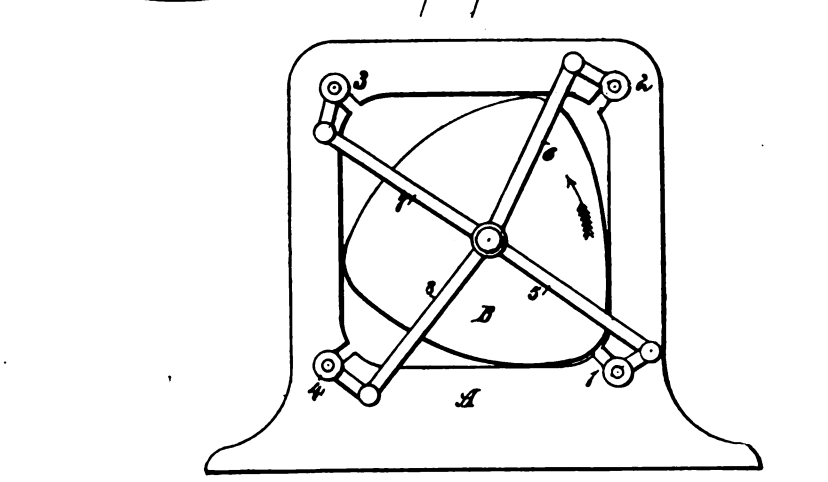
Should, at any time, the American inventor desire a rotary engine and not be able, as heretofore, to find a practical one, and get to a point where one that, while it does not exactly rotate about one center, revolves about three would satisfy him, let him perfect this. I know so little about steam, that I do not feel competent to perfect it myself. Still, I have known it some years, and had reserved it for the future—but? Thus it is in its present form, and if there is any valuable property in it, I present it to the rotary engine men, and everybody else.

A is a casting having a central opening to which the piston, B, is fitted. The corners in A fit the small arcs on the piston, B. Through these corners are the ports 1, 2, 3, 4, and valves operated by the rods, 5, 6, 7, 8. The port 1 is closed, but is about to open, 2 is open full and admitting steam, 3 is closed but is about to exhaust, 4 is open to exhaust. Of course, this valve scheme is not a practical one, but I believe this a new way to make an engine, and that it only needs to have a means to keep it tight, a valve arrangement and the connecting mechanism devised, to make it a good one. As I said before, I am not in steam.

(To be continued.)

Tattoo Marks.

According to Variot, a French authority, the proper way is to wash the part with a concentrated solution of tannic acid, then closely puncture it with a set of needles, such as tattoers use. A crayon of nitrate of silver is next thoroughly rubbed over the area, and after a moment the skin is dried off, when it will be found that the punctures are deeply blackened by the formation of the tannate of silver in the superficial layers of the skin. The cauterization is said to result in an inflammatory reaction for a couple of days, and subsequently in the formation of a crust or thin eschar, which separates spontaneously in from fourteen to eighteen days, leaving beneath it a superficial red cicatrix, which gradually loses its color, and at the end of a few months is scarcely perceptible. Only a small area should be treated at one time, and a dressing of powdered tannin should simply be used.



RECENTLY PATENTED INVENTIONS.

Mechanical Appliances.

PRESS GEAR. — Charley L. Stanley, Montezuma, Ga. This invention relates especially to press gears for operating cotton presses, providing therefor a simple and durable gear which may be quickly reversed, so that the follower may be moved back and forth without stopping the machine. A friction pulley and driving wheel are mounted, one in stationary and the other in movable bearings, and there is a recessed support adjacent to the wheel and pulley in which fits a pulley block having a pulley to contact with the friction pulley and driving wheel, there being a lever mechanism for raising the driving wheel shaft. This gear is also adapted for use with other kinds of presses and machinery.

LUBRICATOR. — Karl A. Jakobson, Christiania, Norway. This is a device adapted to be conveniently connected with machinery to lubricate its parts, and consists of a cylinder of two diameters, a reservoir being connected with the larger portion of the cylinder, while there is a valve-controlled opening in the other portion, a plunger of two diameters being held to slide in the cylinder, the smaller portion of the plunger carrying a slide valve to fit the smaller portion of the cylinder. The plunger serves as a pump to suck oil down from the reservoir and force it outward through suitable tube connections to any part of the machinery, the plunger being connected by a crank with a shaft carrying a ratchet wheel, and moved with a step by step movement by the machinery.

OIL CAN. — Charles B. Underhill, Lancaster, N. Y. This invention covers an improvement upon an oil can formerly patented by the same inventor. The oil can has a spring bottom, while a cap containing air vents closes the upper opening of the body, there being a spring-controlled valve in the cap, so that when the bottom is pressed inward and released a vacuum is made in the can which automatically opens the valve. The can may be used in any position, and when it is almost empty a small quantity of oil may be forced out with as much facility and force as when the can is nearly full.

BRICK MOULD.—Charles E. Simpson, Portsmouth, Ohio. The die, according to this invention, consists of a frame with recesses in its side walls, lugs on the lining plates fitting the recesses and flanges overlapping the edges of the die, there being a filling of easily melted metal between the lining and frame. Lead or Babbitt metal may be used for this filling, whereby the lining plates are held in place, the plates being readily removed by heating the die when it is necessary to replace a worn plate with a new one. Brick moulds fitted with such dies with removable lining plates are especially adapted for use in pressing firebrick, red brick, tiles, etc., as the lining ordinarily wears out much faster than the die in such service.

COTTON CONDENSERS. — George P. Melchior, Bellevue, Miss. This invention provides a simple and novel form of safety cap, so that if the condenser belt slips from the condenser drum an outlet will be opened for the cotton, to prevent it from accumulating and choking within the condenser casing. An intermediate mechanism is provided between the cap or gate and the condenser drive belt, an operating device being supported on the belt and arranged when the support is removed to open the gate by gravity, while the gate may also be opened at will by the operator.

PUMP. — Stephen G. Mills, Wichita, Kansas. This is an improved form of pump designed to allow water to flow out of the bottom of the piston cylinder in order to prevent its freezing up in cold weather. A check valve is hinged to a spring plate at the bottom of the cylinder, a rod extending upward from the plate to a notched lever pivoted in the stock, whereby the plate may be raised, the extent which it may be lifted being governed by an adjustable stop. A priming mechanism is also provided for priming the stock after it has been emptied.

WINDMILL PUMP REGULATOR. — Daniel A. Ferrier, Crete, Neb. This invention provides a device operated by a float and designed to automatically throw the mill in the wind when the cistern is low and throw it out of the wind when a sufficient supply has been received, the construction being such, also, that should the mill be thrown in the wind too suddenly, the pull rope, wire or chain controlling the mill will not be subject to undue strain. The mill wheel may also be thrown into the wind by drawing downward on its rope or cable when the cistern is full.

PIPE CONNECTIONS.—Wilhelm Thielmann, Styrum, near Mulheim, Germany. The manufacture of angle pipe connecting joints in a simple and effective manner is provided for by this invention, which has been likewise patented in eight European countries. A blank of suitable shape is cut out of malleable cast iron, steel, or other metal, and is bent to shape while hot by a machine, with its edges forming the seam adjacent to each other; the moulded angle pipe joint is then placed on the mandrels of a machine and the adjacent edges of the moulded pipe joint while in a heated condition are welded together by being compressed in the machine.

Agricultural.

COTTON CHOPPER AND SCRAPER. — Albert Whitley, Woodville, Miss. This machine is designed to scrape the edge of a row of plants, and chop it out at intervals, to convert the continuous row into a series of hills. A running wheel with cams on its side is mounted on an axial shaft in the rear of the main frame, a slotted chopping arm embracing the shaft and being pivoted to the frame in front, while a chopping hoe is attached to the arm in the rear, a spring forcing the chopping arms against the cams.

MOWING MACHINE.—Edward Bartlett, Belleville, Canada. The cutter bar of this machine is adapted to be raised or lowered as desired, and tilted to and from the ground, in a convenient and expeditious manner, while the machine is light and strong, and comparatively inexpensive. Combined with the main frame and a vertically swinging frame carrying the cutting apparatus is a crank shaft, the cutter-operating arm being connected to the main frame, the crank, and the cutter bar, by universal or ball and socket connections, while a longitudinal spring connects the arm and the swinging frame and acts as a cushion for the crank shaft. In this machine the shoe can be raised sufficiently high to carry the channel bar at an angle of forty-five degrees to the ground.

HAY FORK.—John Anderson, Hickson, North Dakota. The arms of this fork are fulcrumed upon the trunnions of a central lifting beam, two arms upon each of the trunnions, the arms being inwardly curved and consisting of two hinged members, the upper member of each arm carrying a spring-controlled latch adapted to engage with the upper end of the lower member, trip ropes being attached to the latches and means provided for operating the ropes. The device is simple and inexpensive, and will lift either long or short hay, while it can be readily operated to dump the hay cleanly from the carrying arms.

PLANTER MECHANISM. — Albert J. Heivern and William B. Schwalm, Walton, Ind. This invention relates to the driving mechanism for the seed drop bars of planters, and is an improvement on a former patented invention of the same inventors. Combined with the seed drop bar is an actuating mechanism consisting of an endless chain in which are pivoted fingers having a shovel-like lower end and a forwardly inclined head, with cavities in one side face, while spurs projecting forward from the under edges of the links between the fingers are adapted to enter the cavities of the fingers, and hold them while in action in a perpendicular position.

Miscellaneous.

PROCESS OF TREATING ZINC ORES.—William West, Denver, Col. This is a reissued patent for a process of eliminating zinc from complex ores. The ore is roasted to form sulphurous acid gas and oxidize the zinc, and the gas is cooled to 180° F. and passed in gaseous form with steam, without oxidation, into sulphuric acid, through a previously roasted charge, to form soluble sulphite of zinc, and then immediately leached out, separating the zinc sulphite with warm water. The leached ore residuum is simultaneously dried by the transit of the hot sulphurous acid gas, thereby cooling the latter. The zinc is thus separated and recovered from the other metals in a single economical operation, the remaining metals being left in good condition for further treatment.

WRAPPER PASTER.—David W. Collins, Philadelphia, Pa. This device has a paste-holding pan with a longitudinally apertured bottom and an inner bottom having a series of perforations over the apertures of the lower bottom, while there is an adjustable paste discharge controlling slide beneath the lower apertured bottom. The apparatus is designed to automatically supply paste and lay it on the part of each wrapper to be pasted, being more particularly applicable for use with newspaper and similar wrappers, but also suited for use for general purposes, economizing space and obviating the scattering or dropping of paste.

PASTING MACHINE. — George W. Leiman, New York City. The pasting of paper or fabric in tape form is provided for by this machine, which has two graded reservoirs connected by a valved pipe, a paste wheel revolving in the smaller tank, while a shaft carrying a reel is journaled in a hanger over the larger tank, there being a driving connection between the reel shaft and the paste wheel shaft. There is a frictional feed device and a guide pulley, a tape reel being secured to the upper shaft, and a brush is located between the feed device and the paste wheel. The paste is fed from the smaller to the larger reservoir as needed, that the paste wheel may not carry any more paste than is needed, all surplus material being removed from the fabric or paper treated, and the pasted tape being delivered from the machine for convenient application to any object.

TWINE CUTTER. — Frank Grigsby, Alma, Neb. This invention covers an improvement in the class of twine cutters which have a blade and spring plate so arranged that the twine or thread is drawn between them and thus severed. It is a very simple device, adapted to be conveniently attached to a counter or any suitable support, and consists of a twine holder of spring metal having a reversely bent or hook shaped portion, and a shank section similar to that of the cutter, which is arranged parallel and close to one edge of the holder. The end of the twine is held by the holder, after cutting, in convenient position to be again taken hold of when the next bundle is to be tied.

SHUTTER FASTENER. — Edwin T. Keener, Moberly, Mo. This fastener is a simple and inexpensive form of the latch hook type, and is a practical device to securely lock a pair of shutters and release them from the inside of an apartment without raising the sash. The fastener mechanism is mainly supported in a separable casing, and comprises a rocking latch connected with the inner end of a sliding operating rod provided with a locking device to lock the latch against rocking when the rod is turned in one direction.

PORTABLE FENCE.—Charles E. Harris, Winnipeg, Canada. The posts from which the sections of this fence are supported have each a bed beam to which a plate or block is transversely attached, the post proper having recesses at its upper end, and being secured to the plate or block and bed beam. The fence is designed to be staunch and durable, and capable of being expeditiously and easily set up on even or uneven ground, its sections being also readily disengaged for removal.

CHIMNEY CAP. — Joseph A. Hodel, Cumberland, Md. A vibrating valve which automatically adjusts itself to prevent downward draught is employed in this cap, the base plate of which has flanges fitting the chimney flue, while its inverted semicircular cap portion has lateral flanges fitting under retaining brackets or plates, the valve being pivoted in the cap to swing against flanges when vibrated. The construction is simple and inexpensive, and the cap is designed to be thoroughly effective for its purpose.

FIRE ESCAPE. — Michael O'Reilly, Boston, Mass. The hoisting apparatus of this device is carried by a main frame on a truck, or may rest on any convenient support, and has drums operated by cranks to move cables, running over sheaves secured to different points on a building, conveniently operated brakes being provided, and the cables being adapted to raise and support a car opposite any desired part of a building, to carry people safely to the ground, the car being also capable of carrying firemen with their hose and holding them in position to direct a stream of water efficiently.

FIRE ESCAPE.—Peder Thoresen, Svelvig, Norway. The buildings to which this escape may be applied have pulleys at intervals near their cornices, from which depend small wire ropes, by which larger ropes may be hauled up over the pulleys. The escape proper consists of a tubular chute of canvas, whose upper end is suspended on a hinged bar supported by the large rope to be swung horizontally, a bent rod holding the chute open near its top, and a cord extending downward through it, which may be grasped by a person descending in the chute, to regulate the velocity of descent.

EXERCISING MACHINE. — Frank G. Golion, Hoboken, N. J. This device has a platform horizontally fulcrumed between standards on a base, with an adjustable seat, and friction rollers journaled in an opening in the platform near its forward end, a cord attached to the platform and connected with its base passing over the rollers. The machine is designed to afford amusement as well as exercise, and is capable of adjustment to accommodate persons of different weights, while it is of simple construction and may be readily taken apart and packed in a small space.

CHURN DRIVING MECHANISM.—Charles D. Olds, Barnard, Mo. A shaft with a crank arm is mounted in a supporting frame having guide rods in which slides a crosshead, a pitman being connected to the crank arm and to the crosshead, a rod secured to the latter having an angular extension to which the churn dasher is attached. The device is simple and durable in construction, and is designed to greatly reduce the labor of churning.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(3391) P. J. H. asks: 1. How would the flow of water vary to a pump with the height lifted? A. The flow to and through the pump will be the same for various heights, but more power would be required to run the pump with the higher lift. 2. What is the relation between the velocity and friction of water in horizontal pipes? A. Friction of water in pipes is nearly as the square of the velocity. 3. A tank of water 20 feet high by 15 feet in diameter has a horizontal pipe 1 inch in diameter and 100 feet long connected to its bottom. What would be the velocity of its discharge per second? A. The velocity of flow will be 0·89 of a foot per second, and will discharge 0·47 of a cubic foot per minute. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 788, 789, 791, 792, 793, 799, and 805 for an excellent series of articles on hydraulics.

(3392) J. F. S. asks the best thing for keeping my shoulders straight. I have tried shoulder braces, and they do not give me good satisfaction. A. A thorough course of good gymnastic exercise would probably straighten you and help you to keep so.

(3393) O. asks: How many gallons of water evaporated into steam will give one horse power pressure with a properly constructed engine? Also how much can the common gas we burn be compressed in strong canvas gum lined bags? A friend said 3 feet into 1 foot space. I supposed it could be much more. A. 3½ gallons of water to the horse power per hour. You cannot compress gas in a bag, such as you describe, to above a ¼ to ⅓ pound pressure; 3 feet in 1 foot is equal to 30 pounds pressure. For this pressure a metallic cylinder is the best.

(3394) N. B. N. writes: 1. I weighed one hundred and sixty-six pounds about a year ago, and I now weigh only one hundred and forty-two, a loss of twenty-four pounds. I am healthy, eat hearty, sleep sound, and am never sick. I am a blacksmith by trade. Can you tell me the reason of this loss of weight and give me a prescription by which I can regain my former weight? A. Your health being good, there is no advantage in additional weight. You can probably increase your weight by eating more nitrogenous food. All kinds of sweets and sweetened food tend to produce fat. 2. Please give a receipt for the most sensitive invisible ink used with heat and not with light. A. Write with a solution of cobalt chloride. It will appear when the writing is submitted to some heat. Or use a weak solution of nitrate of copper. It gives an invisible writing which becomes red by heat. 3. Give the size of wire to use on an electric bell on a line of 1,000 feet and how many Leclanche cells it will take to run it. A. Use No. 16. About four cells of battery will be required. 4. Can you tell me how the wax on the drum of a phonograph is prepared, and how it is put around the axle or shaft? A. The composition of the phonograph cylinder is a secret. The cylinders slip on a conical drum.

(3395) A. D. B. asks (1) how to make Trouve's battery, thimble size. A. A Trouve battery may be made by providing a plate of zinc, a plate of copper, and a series of sheets of blotting paper of the same size. Have enough sheets of blotting paper to make a pile ¾ of an inch thick. Separate the pile into two halves, soak one pile in a saturated solution of sulphate of zinc, soak the other pile in a saturated solution of copper, put the two piles together, place the zinc plate against the sulphate of zinc side and the copper against the sulphate of copper side. Inclose the whole in a suitable casing and connect a wire with each of the plates, and you have a Trouve battery which will yield a small current for a long time. 2. How to make very smallest battery that will generate current sufficiently strong to be felt if electrodes are applied to tongue or temple, and how long will it run without recharging, I mean a dry or moist battery? A. Probably a chloride of silver battery is capable of being made in as small sizes as any. Consult SUPPLEMENT, No. 157, for information on the chloride of silver battery. The current from any battery is not very perceptible to the touch unless used in connection with an induction coil. A very slight current, however, can be detected by the tongue. 3 What material makes good terminal electrodes? I mean, by terminal, the end of the wires. A. Platinum or carbon would make good terminal electrodes for the ends of the wires. 4. Will the three pieces of electric light carbons 4 inches long, wrapped with one layer of felt and inclosed in amalgamated zinc tubes, contain enough moisture when saturated with solution to generate a current? If so, for about how long without dipping them in solution, and how shall I fix carbons? Would it be necessary to inclose the tubes in anything? A. The battery you describe, if charged with a solution of chloride of ammonium, would work for a few minutes. 5. What makes best battery solution to dip an absorbent material in to use in a dry or moist battery? A. See description of Trouve battery above.

(3396) G. W. V. writes: 1. I have made an electric motor like the one described in 641, and I have wound the magnet and armature with No. 18 bell wire, and would you let me know if that would hinder it from going, because I did not use bell wire? A. The insulation on bell wire is very heavy, and occupies so much room on an armature or field magnet as to prevent winding enough wire in the allotted space. Besides this difficulty, it removes the wires too far from the cores of the field magnet and armature. 2. Would you let me know the difference between bell wire and magnet wire? A. Bell wire or office wire is provided with a single or double covering of cotton braided upon the wire and occupying about four or five times the space needed for covering which is sufficient for magnet wire. Magnet wire is provided with a single or double covering of cotton or silk, which is quite thin. 3. Would you let me know how to make carbon plates and mould zinc plates? A. For information on making carbon plates consult SCIENTIFIC AMERICAN, vol. 60, page 307, or "Experimental Science." You can cast your zincs in a metal mould, or in a sand mould if you have a suitable pattern. 4. Would you let me know how many half pint cells it would take to run the motor I referred to? I used eight. A. Half pint cells are rather small for running the motor referred to. It would require a large number connected up in parallel to equal one cell of large battery. It would be better for you to construct larger cells, such as you will find described in SUPPLEMENT, No. 792. 5. Let me know how to make a paint or compound that would be suitable to paint the inside of a wooden cell for a bichromate battery. A. A wooden battery cell may be rendered acid-proof by soaking it in paraffine, filling in the corners well with melted paraffine. Another method of protecting a wooden cell is to coat it with coal tar pitch. Wooden cells are not very desirable, as they are sure to fail after a time.

(3397) J. S. L. asks how to fasten rubber rolls on clothes wringers. A. Clean shaft thoroughly between the shoulders or the washers where the rubber goes on. 2. Give the shaft a coat of copal varnish between the shoulders and let it dry. 3. Give shaft a coat of varnish and wind shaft tightly as possible with five ply jute twine at once, while varnish is green, and let it dry for about six hours. 4. Give shaft over the twine a coat of rubber cement (see receipt below) and let it dry for about six hours. 5. Repeat 4. 6. Remove washer on the short end of shaft, also the cog-wheel if the shaft has cogs on both ends. 7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft. 8. Clean out the hole or inside of roll with benzine, using a small brush or swab. 9. Put the thimble or pointer on the end of shaft from which the washer has been removed, and give shaft over the twine and thimble another coat of cement and stand upright in a vise. 10. Give the inside or hole of roll a coat of cement with a rod or stick. 11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel. 12. Let roll stand and dry for two or three days before using same. Cement for use should be just thin enough to run freely. If it gets too thick, thin it with benzine. For rubber cement dissolve pure unvulcanized rubber in pure spirits of turpentine. From "The Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3398) W. S. asks: 1. What gas has the greatest lifting and lasting power and how long will it retain its virtue? A. Hydrogen gas has the greatest lifting power, if it may be so expressed, of any gas. There is no question of its "lasting power." Any gas of lower specific gravity than air will last forever. Leakage and diffusion through the pores of the balloon causes the gas to escape and apparently "lose power." Hydrogen escapes thus faster than any other gas. No limit of time can be assigned, as all depends on the envelope or material of the balloon. 2. Would it be possible to inclose it so that it would not waste? A. This has never yet been successfully accomplished. If the metal could be worked thin enough, a copper balloon, which has actually been suggested, would retain hydrogen.

(3399) I. S. A. writes: 1. My cistern sprang a leak and I put about a peck of bran in to stop it. Now the water has spoiled, it smells bad and is harder than before. What is the matter, and can it be purified and how? A. Pump it out, clean it, and stop the leaks with cement. The bran we presume has fermented and occasioned the trouble. 2. Can glass be cast perfect enough to make an air-tight joint without any grinding after casting? A. No.

(3400) Amateur Stone Cutter asks for a method of polishing Vermont marble. I have a small monument cut out of it, rubbed down ready for polishing, and I can't go any further, as I don't know what is used for polishing or how to use it. Also, in rubbing down face to a fine surface it shows an open seam 3 inches or 4 inches long. Would like to know if there is any preparation used by polishers to fill small cracks before polishing, and what it is? A. After rubbing the marble down with fine sand, use pumice stone, either powdered and applied with a felt rubber or in its natural state in the form of a lump with a plane surface. After smoothing with pumice stone, polish with putty powder and water. The cracks may be filled with Portland cement mixed with marble dust, or with a cement formed of oxychloride of zinc. This cement is made by mixing oxide of zinc with a strong solution of chloride of zinc. It is applied in the same manner as putty. You can tint the cement by adding to it while mixing it any of the dry pigments used in painting.

(3401) J. A. P. asks: What size wire should a telephone magneto armature be wound with to run on a 110 volt circuit filled with 4 magnets instead of 2; also what number will it be? A. A magneto machine cannot be used as a motor without providing a commutator to change the direction of the current. For information on this point consult SUPPLEMENT, No. 161. The armature should be wound with No. 30 wire, a sufficient quantity being used to secure a resistance of about 220 ohms. It will have about one-fourteenth of a horse power.

(3402) W. B. Y. asks: Will you please tell me how to make gold and silver alloy, that which is most fusible, and will make the brightest and smoothest castings? A. Silver melts at about 1800° and gold at about 2300°. You can make any mixture to suit the color desired, or you can add a little copper to make a cheaper alloy of a deep gold color. Any of these alloys melt at about 2000°. For details of the alloying of gold and silver with other metals, see the "Practical Gold Worker," $1.25, or "The Silversmith's Handbook," $1.25.

(3403) L. H. P. asks: 1. What kind of acid or chemical is used to write a name on a steel knife blade, and not be defaced by time or use of blade? A. Use nitric acid and water equal parts to etch your knife blade. 2. Is there a good treatise on dairy work, and what is its price? A. We can mail "Handbook on Milch Cows," for $1, and Stewart's "Dairyman's Manual," $1 mailed.

(3404) G. L. asks: Will you please tell me the best way to get rid of worms? We have a beautiful lawn for tennis, but the worms make it almost impossible for us to keep it in good shape. I was advised to try lime, and to put it on when the worms are out at night. We have tried it, and I am sorry to say not very successfully, as it does not kill them unless they get a great dose. It occurred to me that you may be able to tell me what will do it and not kill the grass. A. Reply by Prof. C. V. Riley.—Your ascribing the injury to worms which you say are out at night would seem to indicate that the depredators are the common earth worms or angle worms. Grass lands, however, are frequently injured by the larvæ of May beetles, though these do not ordinarily leave the soil. One remedy for angle worms and also for white grubs is to thoroughly wet the ground with the kerosene emulsion, the formula for the preparation of which has been published in the SCIENTIFIC AMERICAN. A few years ago very successful experiments were conducted with this emulsion on the lawns of the Capitol grounds, and an account of the results is given in the periodical bulletin of the Division of Entomology, *Insect Life*, vol. 1, No. 2. This report will give you the necessary details for the application of the emulsion. The larvæ of May beetles feed on the roots of grasses, and are very injurious to lawns. The earth worms, on the contrary, feed on the earth and the vegetable humus in the soil, and are constantly carrying the soil, through their excrements, from the lower layers to the surface, and as has been shown by Darwin, they are by this means of positive advantage to lawns under certain circumstances. When, however, they interfere with any special object, as in your case, they must be considered hurtful, but beyond the use of lime and kerosene emulsion, as here indicated, I do not know any way of getting rid of them. Heavy rolling will doubtless tend to neutralize their effects, and large numbers of them may be captured at night by means of lanterns, especially after a good rain. They come out of their burrows, under such circumstances, and may be killed in large numbers by any one who is at all quick and active.

(3405) Serouky says: As I incessantly meet with the following difficulty in developing dry plates, will you oblige me, through the columns of your valuable paper, with the information as to the cause and remedy? In developing, the image is slow to make its appearance, indicating under exposure, then comes up gradually until it reaches a certain stage, when fog seems to take hold, and the image continues to develop slowly but uniformly, indicating over exposure, and the result is a flat negative. The trouble is not in the light, and I am convinced that it rests in the exposure or development. I have tried less exposure and the result is under-exposure with heavy contrast. Hence my opinion of its being in the development, and yet I follow strictly the formula coming with the plates. A. If you use the eikonogen developer made up:

Eikonogen	1 oz.
Sulphite of sodium	1 "
Water	30 "

and pour this on the plate without the addition of any carbonate of potash or carbonate of soda, as is usually specified in the plate formulas, and then get the foggy and flat negatives that you describe, the cause is probably due to a poor grade of emulsion on the plate, or to a leakage of weak light through the bellows of the camera. If the emulsion is defective, the rabbet edges of the plate which are not exposed in the camera will fog over just the same as the exposed portion. Old plates poorly packed in ordinary pasteboard boxes separated by strips of card board will fog, because of the deleterious chemicals in the separators. If the plate is under exposed, simply add a few drops of a carbonate of potash solution (1 ounce dissolved in 3 ounces of water) to the above solution and try a fresh box of plates. We have had plates act precisely as you describe and obtained passable but foggy negatives by leaving them in the developer for some time. The edges protected by the rabbets of the plate holder fogged over. We proved the fault to be a defective emulsion on the plate. Another box of the same manufacturer's plates worked under the above developer as beautifully as could be desired.

(3406) S. A. D. asks: 1. What is the ferro-prussiate paper used for in photography, and how is it used? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 584, for full particulars. 2. How long (about) must a Harvard dry plate be exposed on a medium bright day? A. One second exposure with *f*-32 stop in an 8 inch equiv. focus lens, on an ordinary open landscape should be sufficient. Much depends on the subject, the time of day, the lens, and the size of the diaphragm used. 3. How long after the exposure must the developer be applied? What is next done with them? A. After exposure, if the plates are removed from the holders and packed, film sides in contact with each other and surrounded with waxed paper, then placed in a box, they may be preserved for two years before developing. In general it is advisable to develop the exposures as soon as it is convenient to do so. After the plate is developed, the image is fixed by immersing it in a bath of hyposulphite of soda, one ounce to six ounces of water. Then it is washed for an hour and dried. From the negative in a printing frame the photographs are printed on and sensitized in the sun.

(3407) O. S. P. asks: 1. What makes black spots on photographic negatives? Red spots on the prints? A. Black spots may be caused by particles of iron settling on the film when japanned iron developing trays are used, or to particles of foreign matter being embedded in the film. Red spots on prints are due to too weak a toning bath, or to insufficient toning, or to failure to move the prints around in the bath. 2. What is the best material for dusting and polishing camera lenses? A. Use an old clean cambric handkerchief to remove dust, brushing the lens lightly with it. 3. What will take photograph stains off the fingers? A. If the stains are caused by the pyro developer, they can be removed with a dilute solution of citric acid. 4. What causes reddish brown dust to appear on negatives when drying? A. The reddish brown dust is probably a precipitate of iron deposited on the film, provided the plate was developed with the ferrous oxalate or iron developer. It may be removed by immersing the plate in dilute solution of sulphuric acid and water.

(3408) W. F. asks: 1. How to compute the horse power of an engine? A. Multiply the square of the diameter of the cylinder by 0·7854, and this product by the mean pressure in the cylinder. The mean pressure, assuming the usual practice in small engines at five-eighths cut-off, will be 0·92 of the boiler pressure. Multiply the last product by the speed of the piston in feet per minute and divide by 33,000 for the horse power. 2. How much power would an engine have that has a 3×5 inch cylinder, with 50 pounds pressure per square inch on the piston head, and making 100 revolutions per minute? A. For your engine this

$$\text{would be} \frac{3^2 \times 0{\cdot}7854 \times 100 \times 0{\cdot}92 \times \frac{5\times 2}{12} \times 100}{33{,}000} = 1{\cdot}6 \text{ h. p.}$$

3. Give the ingredients of a crucible for melting brass. A. For a crucible use finely pulverized plumbago well kneaded with 10 per cent of pipe clay or porcelain clay, and baked at a red heat after drying. 4. What is Stourbridge clay? A. Stourbridge clay is used also for crucibles. It comes from England. 5. How much heavier is common brass than common pine wood? A. Brass weighs 16 times the weight of the pine pattern. 6. About how many pounds of brass could I melt with a good sized fan run by hand? A. If you use a properly made furnace, you may melt 100 pounds. In a forge with loose brick chamber you may melt 5 to 10 pounds. 7. What should the diameter and weight of a fly wheel be for an engine with a 3 inch by 5 inch cylinder? A. Fly wheel 20 inches diameter, weight 40 pounds. 8. What would be the safe carrying pressure per pound on the piston head of a cylinder ¼ inch thick? A. 100 pounds on cylinder of size mentioned. 9. What is granulated lead, and how is it made? A. Make granulated lead by pouring melted lead into water in a small stream. 10. How can I purify common lead? A. Purify lead by melting and pouring off from the ladle just before it sets.

(3409) Reader asks: Is there such a thing as an effective hair invigorator, and has there ever been any article on this subject published in the SCIENTIFIC AMERICAN or SUPPLEMENT?

A. Quinine sulphate	20 gr.
Tincture of cantharides	2 fl. dr.
Fluid extract of jaborandi	2 " "
Alcohol	2 fl. oz.
Glycerine	2 " "
Bay rum	6 " "
Rose water	15 " "

The quinine is dissolved in the alcoholic liquids by warming slightly, then the other ingredients are added.

Astringent Hair Tonic.

Tannin	1 dr.
Tincture of myrrh	1 fl. oz.
Glycerine	5 " "

From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press. See also SUPPLEMENT, Nos 388, 436, and 396.

(3410) J. C. B. writes: Can you explain the working of a small toy sampan or boat sold here in Japan? The bottom of the sampan seems to be made of thin copper, and a reddish paste is sold with it, which is smeared over the stern of the boat, and when the little craft is put on water, it gayly sails away. The paste smells like a mixture of camphor and ammonia. Can you tell its probable composition and what reaction occurs when it unites with water? A. The principal agent in the above composition is undoubtedly the camphor, which acts by modifying the surface tension of the water, as in the familiar camphor motions. Its exact composition cannot be deduced from a mere description. It would be an interesting subject for experimenting.

(3411) J. J. C. asks: 1. How to prepare nitrous oxide gas. A. Nitrous oxide is prepared by heating ammonium nitrate in a suitable flask. 2. Will No. 16 German silver wire do for the resistance wire in a Wheatstone meter bridge? If so, what is the highest resistance it will accurately measure with a hundred ohm coil for the third resistance? A. No. 16 German silver wire will answer. You can probably measure resistances up to 500 ohms with a meter bridge, using wire of the size given. 3. What should the resistance of a motor be to be run by 16 cells with each an E. M. F. of 1·83 volts and an internal resistance of one-fifth ohm? A. The resistance of the motor should be the same as that of the battery. The power in watts is obtained by multiplying the E. M. F. in volts into the current in amperes. 4. Will German silver wire do as well for the 50 and 100 ohm coils in the tangent galvanometer described in "Experimental Science," as copper? A. It is best to use copper coils in a galvanometer, and if resistance is needed, to insert it in the circuit outside of the instrument.

(3412) C. A. M. writes: 1. Please give the chemistry of a blue print made from a citrate of iron, ammonium and prussiate of potash solution. A. The action of light reduces the ferric salt to a ferrous salt, which latter produces a blue color with ferri-cyanide of potassium. 2. Please give directions for making a photographic camera, or name some good books giving full directions. A. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 625, 670, 507, for photographic cameras. 3. In the SCIENTIFIC AMERICAN of August 29, 1891, query 3313, it says, "Incessant vigilance and putz pomade are to be recommended as a preventive of rust on bicycles." As I understand it putz pomade is very bad for nickel. We had some nickel plated water cocks, and on using the pomade the nickel was soon worn off. A friend who works in a large nickel plating establishment has told me never to use putz pomade on silver or nickel plated goods. A. Putz pomade is recommended and sold by the bicycle trade. It should be used sparingly. Careful wiping is the principal point in the preservation of the plating. 4. Will wood alcohol dissolve shellac, and make a colorless film on applying to wood? A. Wood alcohol dissolves shellac, is nearly colorless as a wood varnish, but sinks into the pores of the wood. 5. On page 70, SCIENTIFIC AMERICAN of August 1, 1891, you say that mineral oils are better than sperm oil for lubricating. Please name a good mineral oil for a bicycle, its expense, where obtained, and whether it will need thinning down, and if so, with what? A. Cylinder oil or sewing machine oil, which can be had from sewing machine agents, is good, and requires no thinning.

(3413) F. E.—Bromide prints may be toned a sepia color, if, after development, and before fixing, they are slightly bleached with a solution of bichloride of mercury. After washing fix in a solution of hyposulphite of soda 1 ounce, water 6 ounces.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 15, 1891,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Bucket, folding or collapsible feed, H. C. Barrett 459,388
Burner. See Lamp burner. Oil burner. Vapor burner.
Butter case, W. R. Tipton 459,464
Button, F. R. White 459,483
Button setting instrument, J. F. Thayer 459,480
Button setting machine, J. H. Vinton 459,481, 459,482
Buttoner, shoe, A. S. Hicks 459,612
Calcimining or removing calcimine, machine for, H. T. Dunne 459,486
Can cover holder, W. T. Stiles 459,598
Cans, combined band coupling and handle for, M. Thoen 459,716
Candy mould, E. E. Euchenhofer 459,700
Cane juice and apparatus therefor, extracting, A. Leblanc 459,496
Canopy frame, I. Popper 459,647
Car coupling, I. N. Brewn 459,626
Car coupling, J. Gingrich 459,398
Car coupling, C. Harrington 459,547
Car coupling, W. C. Watson 459,502
Car door, J. C. Wands 459,665
Car fender, motor, E. Tiemann 459,425
Car roof, J. C. Wands 459,664
Car seat, H. S. Hale 459,564, 459,578
Cars, rheostat for electric motor, S. H. Short 459,690
Carbon battery, fibrous, J. H. Robertson 459,447
Carburetor, C. Hargreaves *et al* 459,579
Carpet cleaning machine, W. Bartholomew 459,540
Cart, road, B. Kern, Jr 459,495
Case. See Butter case.
Chair. See Window chair.
Check marker, C. H. Coggeshall 459,545
Chopper. See Stalk chopper.
Churn, J. Sampson 459,653
Clamp. See Soldering clamp.
Clasp. See Corset clasp.
Cleat, wire, R. Gorton 459,487
Cloth napping machine, H. N. Grosselin 459,521
Cloth shearing machine, E. Spencer 459,725
Clothes drier, J. W. McCandless 459,644
Clutch, friction, P. Medart 459,458
Coal scuttle, C. Whitney 459,619
Coin separator, A. C. Bolton 459,673
Collar and head covering, combined coat, F. W. Bandelow 459,606
Combustion mechanism, T. Brown 459,518
Commutator turning deviee, A. K. Bonta 459,572
Compartment box, J. J. Leech 459,587
Compasses, J. V. Collins 459,519
Corset clasp, J. Day 459,562
Cotton, absorbent, L. T. Burnham 459,608
Coupling. See Car coupling. Thill coupling.
Cradle, Lund & Lauritsen 459,708
Cradle motor, K. I. Sutton 459,555
Croze, K. W. Jacobs 459,457
Crusher. See Ore crusher.
Cultivator, N. Whitehall 459,451
Curtain pole trimming, H. F. Patchen 459,412
Cut-out, F. Bryan 459,560
Cut-out for overhead wires, safety, Froloff & Subbotin 459,721
Cutter. See Bolt cutter. Slaw and ensilage cutter.
Diffusion apparatus, R. M. Sandys 459,654
Ditching machine, E. M. Reese 459,649
Dental engine, A. A. Wilcox 459,428, 459,429
Door, automatic watertight, G. Muller 459,533
Drawing instruments, magnetized head for, R. S. Carr (r) 11,189
Drier. See Clothes drier.
Drum, heating, R. Pugh 459,413
Earring, J. Bulava 459,476
Eaves trough, W. & W. Lossie, Jr 459,473
Electric generator or motor, dynamo, J. Hoduit 459,508
Electric light fixture, E. T. Greenfield 459,705
Electric machine and motor, dynamo, E. Thomson 459,422
Electric machine, dynamo, E. Desrozius 459,610
Electric motor, Davis & Farrington 459,678
Electric push, J. F. Wollensak 459,605
Electric snap switch, G. W. Hart 459,706
Electric switch, B. W. Allen 459,465
Electric wire conduit, H. W. Johns 459,509
Electric wires, cable box for Keller & McCoy 459,523
Electrical alarm system, J. P. McMahon 459,591
Electrical distribution, system of, E. Thomson 459,423
Electrical fixture, E. T. Greenfield 459,704
Elevator mechanism, R. H. Aldrich 459,695
Elevator signal, Andrews & Day 459,452
Engine. See Dental engine. Rotary engine. Steam engine.
Engines, cut-off gear for steam, K. E. Vesterdahl 459,568
Envelope opener, W. J. Pucket 459,461
Evaporating apparatus, brine, L. Bell 459,475
Farm gate, H. Withy 459,472
Faucet, measuring, H. C. Schaffner 459,534
Feed mill, Henry & Wood 459,466
Feed water heater, R. Learmonth 459,585
Fence post, metallic, A. P. Smith 459,594
Fence wire stretcher, G. Shillinger 459,534
Fender. See Car fender. Vehicle wheel fender.
File, bill, J. S. Sammons 459,471
File, letter or bill, C. T. Goewey 459,687
Filter, P. H. A. Gaillet 459,574
Filter press, Johnson & Hutchinson 459,488
Firearms, safety-lock mechanism for, D. B. Wesson (r) 11,191, 11,192
Fire escape, G. C. Foose 459,493
Fire escape, N. Newman 459,513
Fish line reel, C. F. Loomis 459,511
Fishing lines, drying reel for, F. M. Abbott 459,669
Fishing reel, A. B. Hendryx 459,581
Flood gate, R. J. Parrish 459,709
Folding table, H. H. Wiggers 459,427
Frame. See Canopy frame.
Fruit clipping shears, T. G. Maltby 459,409
Fruit gatherer, J. Herring 459,467
Fruit picker, O. P. Smith 459,660
Furnace. See Boiler furnace.
Furnace, W. L. Carter 459,675
Furnaces, apparatus for burning liquid fuel in, J. Fahnestock 459,701
Gauge. See Lead or rule cutter gauge. Micrometer sheet metal gauge.
Galley lock, A. Pearson 459,489
Game counter and pincushion, combined, R. W. Johnson 459,532
Gas engine starter, F. W. Lanchester ..... 459,403 to 459,405
Gas generating machine, automatic, W. F. Singer 459,712
Gate. See Farm gate. Flood gate.
Generator. See Electric generator. Steam generator.
Geodetic altazimuth, T. W. Goad 459,455
Glass pipes, apparatus for the manufacture of, A. Tuerffs 459,490
Glove, ball catcher's, J. F. Draper 459,441
Governor, engine, H. L. Freeman 459,545
Grain binders, band cutter and holder for, O. H. Watkins 459,666
Grain cleaning machine, G. A. Lanoux 459,636
Grain, etc., elevator and cleaner for, J. R. Beynon 459,570
Grain separator and cleaner, H. H. Ring 459,552
Grass receptacle, S. F. Powell 459,460
Halter, R. Bruce 459,541
Hammer, W. Montgomery 459,643
Hammer, drop, R. L. Barclay 459,607
Handle. See Saw handle.
Harness support, N. B. Johnson 459,583
Harvester, corn, G. F. S. Zimmerman 459,517
Harvesting machine, cotton, E. L. Baker 459,621, 459,623
Harvesting machine, cotton, Baker & Emerson 459,622
Hay rake, horse, H. G. Walker 459,617
Heater. See Feed water heater. Steam and hot air heater.
Heater, C. L. Haight (r) 11,190
Hinge, C. A. Forsberg 459,702
Hoisting apparatus, W. I. Babcock 459,434
Holder. See Can cover holder. Shoe holder. Stove pipe holder.
Hook. See Mousing hook.
Horseshoe fastening, E. T. Covell 459,394
Horses, interfering boot for, P. W. Somerlad 459,661
Hose, manufacturing, C. F. Simon 459,536
Hot air motor, closed high pressure, A. J. Ventzki 459,501
Ice cream freezer, J. Baker 459,539
Ice cream freezer, H. Shapel 459,553
Ice runway chutes, switch for, E. Littlefield 459,478
Impalement trap, W. Cameron 459,674
Injector, T. J. Sweeny 459,601
Ink well, W. M. Brown 459,439
Ink well for desks, H. G. Avery 459,433
Ink well for desks, W. M. Brown 459,438
Insulator, C. L. Gerrard 459,686
Interlocking switch, A. G. Leonard 459,497
Iron. See Soldering iron.
Iron and cast steel, composition of matter for purification and strengthening of, C. L. Hartsfeld 459,494
Japanned ware, oven for baking, J. W. Anderson 459,432
Jeweler's forceps, D. Mendelson 459,641
Journal box, sectional, C. M. Conradson 459,627
Journal, self-lubricating, J. Farley 459,628
Kiln. See Lime kiln.
Knitting machine, circular spring needle, D. F. Sullivan 459,714
Knitting machines, automatic stop motion for, C. E. Sharp 459,659
Knob attachment, F. M. Kidder 459,444
Lamp, L. Henkle 459,400
Lamp burner, E. Dickinson 459,492
Lamp, electric arc, E. R. Knowles 459,510
Lamp socket, incandescent electric, J. O. Phillips 459,514
Last rack, F. W. Stickney 459,537
Lathing, machine for producing metal, H. A. Stone 459,726, 459,727
Lathing, metal, W. W. Bostwick 459,625
Lead or rule cutter gauge, D. L. Shivers 459,593
Leather cutting machine, S. J. Talbott 459,715
Letter box, street, J. T. Lenman 459,550
Level and folding square, combined plumb, A. V. Nordenson 459,446
Lime kiln, fluid fuel, W. B. Wright 459,693
Link bending machinery, J. W. R. Johnson 459,401
Links, etc., fastening to be used as sleeve, C. Jackson 459,469
Lock. See Galley lock. Nut lock. Time lock.
Lock, G. J. Bedford 459,484
Loom shedding mechanism, H. Wyman 459,474
Mail bag, J. Hanauer 459,631
Mailing machine, W. F. Barnes *et al* 459,387
Measuring machine, grain, R. R. Howell 459,729
Meat chopping machine, L. Steigert 459,450
Metal box, W. H. Atkinson 459,696
Metal planing machine, Z. B. Coes 459,393
Micrometer sheet metal gauge, H. V. Bernhardt 459,672
Milking apparatus, H. Horlyck 459,582
Mill. See Feed mill.
Mineral drilling machine, E. A. Sperry 459,596
Mould. See Candy mould.
Motor. See Cradle motor. Electric motor. Hot air motor.
Mousing and safety hook, F. C. Ziegler 459,531
Mower sharpener, lawn, J. H. Pitman 459,479
Mowing machine, G. G. Hunt 459,443
Musical instrument, mechanical, J. L. Muller 459,590
Musical instrument, stringed, W. A. Tuebnee 459,603
Musical instruments, tail piece for, C. L. Robinson 459,414
Muzzle, E. B. Webber 459,557
Muzzle, dog, F. L. A. Canary 459,609
Nail plate feeder, C. E. Houghton 459,546
Nut lock, J. T. Pearman 459,645
Oil burner, C. H. Straffin 459,599
Oiler, J. T. Smith 459,462
Ore concentrator, A. Fraser 459,684
Ore crusher, A. H. Schierholz 459,657
Outlines of objects, instrument for describing, W. Potter 459,648
Overseam work, combined fabric and thread in, H. H. Fefel 459,720
Padlock, C. A. Moore 459,499
Paint indelible, fluid for rendering oil, R. W. Surby 459,691
Paper bag machine, Lorenz and Claussen 459,445
Paper box, angular, D. S. Clark 459,542
Paper box, angular, Clark & Osborne 459,543
Paper roll, wrapping or toilet, S. Wheeler 459,516
Pencil forming machine, slate, D. R. Satterlee 459,655
Photographic apparatus, automatic registering, E. E. Moore 459,411
Picture frame fastener, J. A. Montz 459,513
Pile or dog log, J. Osterhoudt 459,500
Pipe or hollow shafting, steam joint for rotary, J. B. Morgan 459,692
Pipe wrench, T. Bird 459,559
Planers or other machines, clamp for, Chalmers & Wallace 459,530
Planter, W. A. McAlpine 459,551
Planter, corn, O. A. Berio 459,671
Plow, J. W. Montgomery 459,410
Plow, J. W. Rutherford 459,415
Plow, W. H. Wilson 459,667
Plow, gang, F. M. Mecum 459,524
Post. See Fence post.
Power. See Ratchet hand power.
Power press, N. C. Stiles 459,597
Press. See Baling press. Filter press. Power press.
Printer's take marker or galley attachment, B. W. Gillis 459,397
Projectile, Sherlock & McIntyre 459,417
Pulverizing wood, A. Mitscherlich 459,389
Pump, A. W. White 459,529
Pump, air compressing, L. J. Genett 459,685
Punkas, apparatus for working, H. E. Walter 459,663
Rack. See Last rack. Window rack.
Radiimeter, J. F. Scheller 459,656
Rails, chair for girder, W. C. Wood 459,717
Railway danger alarm, Haynes & Allen 459,456
Railway, overhead, J. W. Moyer 459,566
Railway signal, H. C. Horstmann 459,633
Railway switching device, street, R. T. Smith 459,418, 459,419
Railways, automatic danger signal for, W. I. Herrick 459,707
Rake. See Hay rake.
Range or stove, H. Born 459,436
Ranges, water heating attachment for, H. C. Steinhoff 459,662
Ratchet hand power, G. W. Davis 459,677
Reel. See Fish line reel. Fishing reel.
Rein support, G. W. Hall 459,522
Ring. See Ear ring.
Rinsing tub, J. D. Kelly 459,635
Rivet and making the same, tubular, H. S. Reynolds 459,650
Rope sheave or pulley, W. Goyne 459,577
Rotary engine, G. A. Thomson 459,424
Sash fastener, T. J. Daniel 459,676
Saw, J. Class 459,477
Saw, buck, G. R. Hardison 459,399
Saw guide, band, G. F. Striegel 459,600
Saw handle, A. M. Roscoe 459,652
Sawmill dog, J. D. Owen 459,526
Saw set, R. James 459,548
Scow, Scuther & Chapman 459,420
Screws, knobs, washers, etc., machine for making, G. Wust-Guyer 459,558
Seat. See Car seat.
Secondary battery, W. L. Silvey 459,535
Separator. See Coin separator. Grain separator. Steam separator.
Sewer trap, J. A. Coleman 459,440
Shaping machine, W. R. Fox 459,629
Shears. See Fruit clipping shears.
Sheet metal box, W. H. Atkinson 459,697
Shoe, J. Heckel 459,722
Shoe holder and detacher, J. Donauer 459,680
Show stand, revolving, F. Pearce 459,592
Shutter fastener, A. P. Merrill 459,512
Signal. See Electric signal. Railway signal.
Skaters, ankle supporter for, G. Von Rohonczy 459,616
Slaw and ensilage cutter, C. J. Miller 459,459
Snarling machine, T. A. Tripp 459,602
Soda with strontium salts, making, G. H. Gray 459,688
Soldering clamp, adjustable, A. B. Lee 459,637
Soldering iron, W. Bechtold 459,718
Spinning machines, spindle band tension regulator for, P. Feather 459,454
Spinning machines, yarn separator for, T. H. Speakman 459,713
Spraying device for vines, shrubs, etc., M. J. Caswell 459,573
Spread eagle, H. Fachs 459,683
Sprinkler, G. B. Smith 459,449
Stalk chopper and cotton thinner, C. S. Mauldin 459,640
Stand. See Show stand.
Steam and hot air heater, combined, W. H. Denslow 459,395
Steam boiler, J. T. Smith 459,724
Steam boiler, F. Sommer 459,463
Steam boiler and generating appliance, F. E. Fitch 459,520
Steam boiler, coil, J. A. Svedberg 459,528
Steam couplings, universal joint for, T. W. Moran 459,565
Steam engine, compound, J. H. Eickershoff 459,507
Steam engine, W. T. Lord 459,407
Steam generator, D. Almy 459,538
Steam separator, H. E. Longwell 459,498
Stonecutters' use, sliding gauge for, D. J. Doane 459,679
Stove for heating purposes, oil, B. F. Goodrich 459,531
Stovepipe holder, W. H. Schuster 459,658
Switch. See Electric switch. Electric snap switch. Interlocking switch.
Switch boards, fastener for spring jacks of, C. E. Scribner 459,711
Switch for overhead tracks, J. Bouchard 459,437
Table. See Folding table.
Tapping mains, device for, M. P. Madden 459,638
Telegraphic apparatus, W. E. Sloan *et al* 459,448
Thill coupling, W. J. Patterson 459,710
Tile tamping machine, C. A. Carpenter 459,390
Till alarm, H. Garrett 459,442
Time alarm, S. E. Jones 459,402
Time lock, J. White 459,618
Tire, bicycle, W. Richwine 459,614
Tobacco for cigar bunches, machine for preparing filler, H. Schmidt *et al* 459,416
Tobacco pipes or cigar holders, mouth piece for, M. L. Schloch 459,730
Tongue support, wagon, T. H. Ink 459,731
Toy, F. H. Harris 459,580
Trap. See Animal trap. Impalement trap. Sewer trap.
Trolley, slide shoe, S. H. Short 459,689
Trolley wheel, G. E. Lewis 459,588
Trolley wire connection, R. L. Caldwell 459,485
Trough. See Eaves trough.
Truck, barrel, F. H. Zahrn 459,430
Trunk lids, fastening and protecting device for, C. T. Wilt, Jr 459,505
Tub. See Rinsing tub.
Tubes, machine for cutting screw threads on, O. Bryant 459,389
Tuyere, N. M. Langdon 459,470
Typewriter cabinet, V. Lapham 459,406
Valve, check, J. R. Goehring 459,576
Valve for steam and basin cocks, F. P. Werner 459,728
Valve gear, A. Riedler 459,515
Valve gear for engines, reversing, J. C. Nicholson 459,525
Valve, straight-way, E. Lunkenheimer 459,408
Vapor burner, W. M. Abbott 459,694
Vehicle wheel fender, J. M. Reynolds 459,651
Velocipede, C. S. Leddell 459,586
Velocipede wheel, C. E. Duryea 459,699
Velocipedes, driving mechanism for, Evans & Cowan 459,682
Vision, device for assisting, D. W. Groh 459,563
Vulcanizing apparatus, W. E. Hathaway 459,632
Wall paper exhibitor, A. F. Payne 459,567
Wash boiler, L. Jones 459,549
Wheel. See Trolley wheel. Velocipede wheel.
Window chair and step ladder, combined, M. B. Blazier 459,571
Window rack for flower pots, wire, H. R. Van Eps 459,604
Wire stretcher and tension device, J. B. Cleaveland 459,392
Wrench. See Pipe wrench.
Zinc, electrolytically obtaining, A. Watt 459,556

DESIGNS.

Buckle, J. W. Harriss 21,037
Car body, railway, J. Hammond 21,042
Carpet, C. W. Swapp 21,039
Dress trimming, E. Engstfeld 21,033
Easel, F. J. X. Miller 21,048
Easel, flower, C. A. Peters 21,044
Lamp, shade, hanging, C. W. Ledig 21,035
Show card, J. T. Story 21,047
Spoon, E. L. Everett 21,034
Spoon, J. W. Mealy 21,043
Spoon, W. F. Michael 21,040
Spoon, H. A. Spaulding 21,041
Spoon, G. Wilkinson 21,045, 21,046
Spoon, etc., A. F. Jackson 21,038
Toy savings bank, Shepard & Adams 21,036
Wall paper, C. Booze 21,032

TRADE MARKS.

Baking powder, G. De Camp 20,127
Bird cages, O. Lindemann & Co 20,128
Candy, pipe, Chase & Company Corporation 20,144
Canned fruits and vegetables, A. Booth Packing Company 20,142, 20,143
Cements, Mc Lean & Company 20,148
Coca wine, J. Morningstar 20,133
Coffee essence, Pfeiffer & Diller 20,130
Cotton pile fabrics, velveteens, and plushes, J. Dougan & Co 20,145
Disinfectants and deodorizers, Hattie & Mylius 20,146
Flour, wheat, J. P. Baden 20,140
Headache and neuralgia cure, P. W. Vaughan 20,138
Hooks and eyes, J. C. Newey 20,129
Liniment for animals, A. Burrows 20,125
Medicine for the prevention of seasickness, Poseidon Co 20,134
Milk, condensed, Wisconsin Milk Condensing Company 20,136
Musical instruments, wind, F. Besson & Co 20,132
Packing, composition, Revere Rubber Company 20,135
Pianos, Sohmer & Co 20,150
Remedy for the blood, botanical, A. B. Scutt 20,137
Scythe stones, C. E. Strong 20,131
Sheetings, shirtings, and drills, cotton, Henrietta Mills 20,147
Soap, laundry, G. Reichhard 20,149
Starch, laundry, J. W. Wright & Co 20,139
Toilet preparation for the skin, Davis Chemical Co 20,126
Underwear and jackets, Beach Manufacturing Company 20,141

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print, issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

PROPOSALS.

Proposals for supplying Cut Stone.—United States Engineer Office, Montgomery, Ala., August 30, 1891. Sealed proposals, in triplicate, for supplying cut stone at Wetumpka, Ala., will be received at this office until 12 o'clock noon, standard time, on October 3, 1891, and will then be opened. The attention of bidders is invited to the Acts of Congress approved February 26, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large. Specifications, instructions for bidders, and blank forms for proposals may be obtained at this office.
PHILIP M. PRICE, *Captain Corps of Engineers U. S. A.*

WATERWORKS WANTED.—Sealed bids will be received by the City Council of the City of Eagle Pass, Texas, until 8 o'oclock p. m., October 20, 1891 and then opened, for furnishing labor, machinery, material, etc., necessary for the erection of a complete system of waterworks for this city, in accordance with the following data as to capacity and extent of ground to cover: 2 Worthington duplex compound pumps, capacity 500,000 gallons a day; 2 steel boilers, 50 horse power each; 1 feed pump; 1 stand tower, 16x100 feet; 25 Ludlow fire hydrants; 250 feet cast iron pipe, 10 inch diameter; 5,800 feet cast iron pipe, 8 inch diameter; 550 feet cast iron pipe, 6 inch diameter; 8,850 feet cast iron pipe, 4 inch diameter; 13,275 feet cast iron pipe, 2½ inch diameter; and all necessary connections. The stand tower is to be erected on the north side of the city; the ground south of tower has a gradual down grade of 20 feet in 2,500 feet, and the ground on the east and west is level. There are no creeks, gullies, or objectionable elevations in the city, and the earth is light, sandy, easy to work, and free from rocks. All necessary masonry and the pump house to be constructed by the city, the cost of same not to be included in the bids. Bids must be accompanied by a certified check for $1,000, as a guarantee of good faith. The Council reserves the right to reject any or all bids. Information furnished on application. Address CHENEY R. PROUTY, Mayor.
Eagle Pass, Texas, September 9, 1891.

RADII OF CURVATURE GEOMETRICALLY Determined.—A paper by Prof. C. W. MacCord, C.E., D., giving directions for drawing helices. With 2 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **732.** Price 10 cents. To be had at this office and from all newsdealers.

TYPHOID FEVER.—A VALUABLE paper by Prof. Dujardin Beaumetz, showing the great progress that has been made in recent years in the treatment of this dangerous disease. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **800.** Price 10 cents. To be had at this office and from all newsdealers.

A CONNECTICUT PEACH ORCHARD.—By J. H. Hale. An interesting description of a farm on which 16,000 bushels of peaches are obtained from 35 acres. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **769** and **770.** Price 10 cents each. To be had at this office and from all newsdealers.

REPORT ON INSECTS.—BY PROF. C. H. Fenald. A history of some common, injurious insects, and the methods of destroying them and holding them in check. With 26 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **802** and **803.** Price 10 cents. Each to be had at this office and from all newsdealers.

THE BUILDERS OF THE STEAM ENGINE.—The founders of modern industries. Address by Dr. R. H. Thurston, delivered at the Centennial Celebration of the American Patent System. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **802** and **803.** Price 10 cents each. To be had at this office and from all newsdealers.

COAL TAR OR ANILINE DYES.—A list of the principal coal tar dyes occurring in commerce, with their reactions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **801.** Price 10 cents. To be had at this office and from all newsdealers.