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MODERN BLAST FURNACE, SHOWING AUTOMATIC HOISTING AND CHARGING EQUIPMENT.—[See page 172.]

SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, MARCH 8, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE FASTEST LONG DISTANCE TRAIN IN THE WORLD.

We are informed that a new train has lately been placed on the Paris-Calais run, for the convenience of travel between Paris and London, which is scheduled to cover the distance of 184½ miles in three hours. This very fine performance is accomplished in spite of the fact that there is a stop of four minutes at Amiens, and that the speed is greatly reduced in running through the city of Calais to the pier where passengers embark for Dover. The announcement will give no surprise to those of us who have watched with interest the development of express train service on the leading French railroads. It is only of late years that France has brought her railroad system up to a pitch of perfection in comfort and speed at which it has ranked with the best railroads of the world. The improvement has been so rapid that, for the past three or four years, the French roads have not only surpassed in speed the trains for which Great Britain has been justly noted for half a century, but they have instituted a schedule of fast passenger trains which is absolutely without a rival either in Europe or America. There are over fifty express trains on the various French railroads with a speed including stops of over 50 miles an hour, and more than half of these run at an average speed of over 55 miles an hour. They have also been running during the past two years a few trains that reach an average of 60 miles an hour, but the distance was comparatively short. The Paris-Calais run, however, is made at a higher average speed than that of any express train in France, and although the distance run without a stop is less than that covered without a stop by the Empire State Express, the fastest long-distance train in this country, the average speed, 61½ miles an hour, is 7 miles an hour greater. The weight of the regular Empire State train behind the engine is 200 tons. We have no particulars as to the weight of the French train, but it is probably something less than that. There is food for thought, in the fact that the best work on these trains is being done by the four-cylinder express engines of the compound type.

COST OF WIRELESS TELEGRAPHY.

Successive steps in the establishment of wireless telegraphy follow each other with a rapidity which is quite unprecedented in the development of a new invention. It is not many weeks since the first successful signals were transmitted across the Atlantic, and in the interim the inventor has returned to England, completed his arrangements, and is now on his way back to America for the purpose of establishing a permanent station for the regular transmission of commercial wireless messages. Furthermore, it is announced that a contract has been made with the Canadian government for the transmission of ordinary transatlantic messages for ten cents a word, with a press rate of five cents a word. In accordance with this contract, the Canadian government will contribute $80,000 toward the erection of a station in Nova Scotia. At present the rate for general messages is 25 cents; so that the general public in Canada reap the immediate benefit of a reduction in the rate of fully 60 per cent.

Thus again do we see the indomitable patience of one man bring to fruition, after years of patient investigation, another of those epoch-making inventions, which are destined from the very first to bring untold benefit to the world at large and well-earned prestige and wealth to the inventor himself. In this age of increasing travel and multiplying international interests of a political, commercial and private character, this facilitating of communication between the old and new world will be beneficial to a degree that can scarcely be estimated. To the private individual particularly, will this great cheapening of telegraphic communication be welcome, as it brings the transatlantic "cablegram" within reach of a vast number of people to whom it is an impossible luxury at the present price. It is true the commercial success of the system has yet to be demonstrated; but Mr. Marconi has been so uniformly modest and conservative in his claims, and has evidently been careful never to announce his achievements until he had proved beyond a doubt their practicability, that the public will have every confidence in the inventor's ability to carry out to the letter his contract with the Canadian government.

A 70,000 HORSE POWER PLANT.

Another notable step has been taken in the development and application of the steam turbine. The Metropolitan District Railway, London, which is about to substitute electrical traction for the old steam locomotives that for several decades have rendered travel on this line hideous, is to make use of the steam turbine in a great central generating station, which will be located at Chelsea. The minimum output will be 70,000 horse power, and the plant will consist of ten Westinghouse-Parsons steam turbines, each of 7,000 minimum horse power capacity. Not only will this be the largest aggregation of steam turbines in the world, but it is scarcely necessary to say that the turbines themselves will be by far the largest ever built. At present the 2,000-horse power turbine at the generating station of the Hartford Electric Light Company is the most powerful in existence; two are also being constructed in Europe for electric lighting at Frankfort and Milan, each of which will be of 5,000 horse power.

The advantages of a steam turbine plant for electric lighting are many and valuable. In the present case the three-phase generators, each of 5,000 kilowatts capacity, will be mounted direct on the turbine shafts, and will be driven at the high speed of 750 revolutions per minute—a high speed for electrical work, but a low speed in comparison with those to which we have been accustomed in the steam turbine. An immediate advantage of the high speed, electrically considered, is that much smaller dynamos can be employed than would be necessary if slow-speed, reciprocating steam engines were used. If our readers refer to the description of the power station of the Manhattan Elevated Railroad given in the SCIENTIFIC AMERICAN of January 11, they will notice that the electrical units used at that station are of the same capacity, namely, 5,000 kilowatts, but that the speed of revolution is only 75 per minute. Consequently the generators are huge constructions, 42 feet in diameter and 445½ tons in weight, with 40 field-magnet poles. Compare this with the compact generators in the District Railway turbine plant, which, because they revolve at ten times the speed, will require only four poles and will have an external diameter of only 9 feet. It is evident from these figures that there will be a great economy in space and material secured by the use of the steam turbine in an installation of this kind. It has been proved furthermore in the experience that has been gained with large turbine units, that the economy of steam consumption is lower than that which has been obtained with the best types of reciprocating engine, the conditions of steam generation being of course the same. It has further been shown that the economy increases with the increase in size of the unit; and hence it is reasonable to look for very favorable results from a plant made up of 5,000-horse power generators. Other advantages that would be realized are the entire absence of vibration and the absence of oil from the water of condensation.

There is another benefit derived from the use of the steam turbine in an electrical power plant; we refer to the perfectly uniform turning moment. It is well understood that in a system which generates three-phase currents for transmission and conversion at substations, it is of importance to secure as perfect an angular velocity of the engine and generator as possible. Should there be any variation, there is a confusion of the phases which, if it exceeds a certain degree, is liable to throw the rotary converters out of step and tie up the line. In the Metropolitan Street Railway plant, it will be remembered, the problem is solved by placing the two cranks at an angle of 135 degrees with each other, so as to secure eight impulses at equal intervals in each revolution of the shaft. In the steam turbine, the dead center of the reciprocating engine is of course entirely eliminated, and there is a perfectly constant turning moment throughout the entire revolution. As regards the question of speed regulation, under the fluctuating load imposed on a central electrical power station, such as this, the turbine is well equipped, the steam being admitted to it in a series of well-regulated and continuous admissions, which at full load are so close as to constitute what is practically a continuous feed. Finally, the turbine has a distinct advantage from the fact that a much higher vacuum can be used than is possible in the case of the reciprocating engine, the exhaust from the lower-pressure turbine being at zero.

There is no denying that the question of both the steam engine and the electric generator for large central power plants has reached an extremely interesting if not critical stage. The compact steam turbine and four-pole generator running at 750 revolutions per minute stand out in very strong contrast to the giant four-cylinder reciprocating engine and the 40-pole, 445-ton generator running at only 75 revolutions per minute. One or other of these is bound to become the permanent type for future work of this kind; and we must confess that judged by its past performance and its future promise, the turbo-electric plant would seem to be the standard for the future. Unless the matter of equipping the central power station for the Rapid Transit Subway has progressed too far to admit of any change of plans, the Commissioners and their engineers should carefully weigh the merits of the turbo-electric installation before committing themselves to the erection of one more of the costly reciprocating-engine power stations, of which three have been built lately in this city.

HOW VARIOUS COUNTRIES SUBSIDIZE THEIR MERCANTILE MARINE.

In view of the interest aroused in our shipping subsidy bill to be brought before Congress during the next session, it is interesting to observe the various means adopted by European nations to encourage their mercantile marine. The steamship lines of Great Britain receive no state assistance beyond, in certain cases, a subvention, which is in reality too insignificant to be worthy of notice, for employing particular vessels as auxiliary cruisers in time of war, and for postal work. Since, however, the carriage of mails involves the allocation of a certain amount of space for the mail bags, and officials attached thereto, and is somewhat similar to freight, this payment can scarcely be termed a subsidy. The German lines are the most heavily state-subsidized steamship lines in the world, and but for this government assistance, it is very doubtful if Germany would have attained its present position in the mercantile marine among the maritime nations of the world. Certainly no fast steamships such as the "Deutschland," "Kronprinz Wilhelm," and "Kaiser Wilhelm der Grosse," would have come into existence. The total imperial subsidy granted by Germany to steamship lines amounts to $1,737,500 per annum, and is distributed among the North German Lloyd, of Bremen, and the German East Africa Company, at Hamburg. There is in addition to this a small imperial subsidy granted for a service recently established to compete for the West African trade. The German East Africa line receives $337,500 a year for a fortnightly service circumnavigating Africa in alternate directions. The North German Lloyd receives $825,000 per annum for a fortnightly service direct to China and Japan, and $575,000 for a monthly service to Australia. In addition to this there is an amount of $325,000 paid to the Hamburg-American and North German Lloyd companies for the carriage of mails. As before stated, the British government extends no pecuniary assistance to the various steamship lines, beyond a postal subvention, though it is often erroneously stated that this remuneration is equivalent to a subsidy. Comparison therefore between a German and English steamship company is scarcely possible. Both the P. & O., the largest steamship company in Great Britain, and the North German Lloyd run a large fleet of vessels in addition to those employed exclusively in carrying mails on the Australian and Eastern service. The total tonnage of the North German Lloyd fleet at the end of 1900 was 405,987 tons, and that of the Peninsular and Oriental Company, of London, 340,000 tons. The P. & O. Company receive the sum of $1,750,000 per annum for a fortnightly service from Brindisi to Shanghai, a weekly service from Brindisi to Bombay, and a fortnightly service from Brindisi to Adelaide. Of this sum approximately $425,000 is allotted to the Australian service, Brindisi to Adelaide, covering about 9,100 miles, including ports of call. If 2,500 miles, about the distance from London to Brindisi—the P. & O. are obliged to run to Brindisi to pick up the mails—and 1,075 miles, representing the mileage from Adelaide to Sydney, are added, a total distance of 12,675 miles, the nearest possible approach to an absolutely comparative basis is obtained. The North German Lloyd receive $575,000 per annum for a monthly service from Bremerhaven to Sydney, a distance of about 13,100 miles, including ports of call. The P. & O. Company run fifty-two voyages in a year, and the North German Lloyd run under their contract, at least twenty-six voyages a year. This works out at 66.105 cents per mile for the P. & O. and Orient companies, and $1.68819 per mile for the North German Lloyd. And as the Colonies and India contribute from their postal receipts a sum equal to half the total P. & O. postal subsidy of $1,750,000, it is not perhaps too much to assume that the British Post Office collects at least a similar amount from the carriage of mails outward, the deduction being that the postal matter carried by the P. & O. pays for itself, and is no burden whatever upon the British taxpayer. The North German Lloyd have within the last two years, distributed dividends of 7 per cent and 8½ per cent. The P. & O. average a dividend on preferred stock of over 11 per cent, and nearly 8 per cent all round. It is quite open to say that the German company receive 7 per cent of the 8½ per cent in subsidy, and the P. & O. 10 per cent out of the 11 per cent. Both mail services, however, are in consequence of this subsidy run in a more extravagant manner than a purely commercial line would be, and the mileage comparison shows that the English company give the greater value for their subsidy than the German, or in other words the latter probably apply a much larger proportion of their subsidy to dividend purposes than the English company. It is only by means of this state assistance that Germany has been able to compete with England in the mail trade in the East—since Great Britain had such a firm monopoly that other than subsidized lines could not have run against them profitably. German competition, however, has not affected the English trade, but has rather developed it. Other European countries do not subsidize their steamship lines in the way that Germany does. Russia grants special subsidies to certain lines, which, however, chiefly trade within the Russian empire. There is also the volunteer fleet which plies between the Black Sea and eastern Siberian ports. This line calls at some Eastern ports, but carries little cargo, and is chiefly devoted to government political purposes. Japan grants general subsidies upon construction, mileage runs, and also special subsidies to the Nippon Yusen Kaisha to India and Europe, and the Toyo Kisen to San Francisco. The subsidy of the Nippon Yusen Kaisha averages an amount equal to two-thirds of the expenses per voyage, a very large subsidy. Austria grants a subsidy on shipping which, assuming that the freights earned covered expenses, would permit an average dividend of about 15 per cent to be distributed. The bounties of France are equal to about 12½ per cent on the value of the mercantile marine. It is a curious fact, however, that in none of these European countries is the state subvention regarded with satisfaction. Germany, which has been lavish in this direction, is indeed looking forward to the day when traffic with the East and Australasia will be sufficiently remunerative to enable the subsidy to be withdrawn. Such a state of affairs is very remote, however, at present, since English trade in those parts is so secure that the German competition has no effect upon it, whatever. Germany, in fact, has to create a new and special trade for her steamships, and the work is proving difficult, since the English lines offer more frequent services, and, on the whole, are much faster than the German boats plying between Europe and the East.

THE HEAVENS IN MARCH.

BY HENRY NORRIS RUSSELL, PH.D.

As we regard the evening sky at the present season we cannot help being impressed by the greater brightness of the western half in comparison with the eastern. Following the Milky Way up from the northern horizon we pass in succession the zigzag line of Cassiopeia, the bright group of Perseus, the irregular pentagon of Auriga, the parallel lines of Gemini, the lonely Procyon, and the brilliant Sirius, till we reach the southern horizon among the stars of Argo.

Below Auriga and Gemini to the west lie Taurus and Orion, perhaps the most familiar constellations of all. Aries and Andromeda are just setting in the northwest below Perseus.

The brightest stars in the eastern sky are Arcturus, in Boötes, and Spica, in Virgo. At our usual hour of 9 P. M. in the middle of the month they are both low down in the east. The former is the brightest star, except Sirius, in our skies, and may at once be recognized by its reddish color.

The sky east of the meridian is occupied by three large constellations. Ursa Major is the northernmost, extending north and east from the zenith. Leo comes next, with its familiar "sickle," and the bright star Regulus. The head of Hydra is midway between Regulus and Procyon, and from it the long line of the constellation stretches southeastward toward Spica. A small but conspicuous group to the right of the latter star forms the constellation of Corvus, or the Raven.

In the circum-polar sky Cepheus is below the pole, and Draco and Ursa Minor are east of it.

The most interesting recent astronomical news has to do with the nebula which surrounds the new star in Perseus, of which we spoke a few months ago. Traces of it have been discovered on a photograph taken at the Lick Observatory last March, which, like those obtained last autumn and winter, shows that the nebula has been steadily expanding, starting from the star itself at the time of its outburst. It is now nearly equal to the moon in apparent diameter, and is still growing. Recent observations also show that the star has no sensible parallax; that is, that it is by no means one of our nearest neighbors.

The enormous rate at which the nebula appears to move has been very simply explained by Prof. Kapteya, an English astronomer, as follows: Suppose that the new star is surrounded by a great cloud of meteoric dust, or something of that sort. The light sent out by the star during its short period of brilliancy will light up this dust as it travels through it, so that it will appear, when seen from a great distance, as a faintly luminous ring surrounding the star. This ring will appear to move outward in all directions with the velocity of light—186,000 miles per second—which is certainly fast enough. The irregularities of the nebula as photographed can be accounted for by assuming that the dust is thicker in some places than in others.

On this hypothesis the distance of the Nova may be calculated from the apparent size of the nebula. We give only the results here, referring for the proofs to a letter by Mr. W. E. Wilson in Nature for January 30.

It appears that the new star is so far off that it takes its light about 250 years to reach us. Its actual brightness, during the few days when it was at its best, was about 10,000 times that of the sun. It still gives out ten times as much light as the sun does, though it is now invisible to the naked eye. Finally, the outburst which we saw last year must have taken place about the year 1650, its light having taken all the intervening centuries to reach us.

THE PLANETS.

Mercury is morning star in Aquarius, rising about an hour before the sun. On the 16th he reaches his greatest western elongation. He is farther from the sun than usual, but, being south of him, is not as easy to see as he was at his recent evening appearance. Venus is also morning star, and is in a situation very much like Mercury's, but farther from the sun, so that she rises from one and a half to two hours before sunrise. She is rapidly growing brighter, and on the 20th is at her greatest brilliancy, being once more easily visible in the daytime, if one knows just where to look for her. Mars is within a few degrees of the sun, and therefore cannot be seen. The sun, whose apparent eastward motion among the stars is faster than his, overtakes him on the 29th, and he becomes a morning star, though he will not be visible in that capacity for some time to come.

Jupiter and Saturn are morning stars in Sagittarius. On the 15th the former rises over two hours before the sun, and the latter nearly three.

Uranus is morning star in Scorpio. On the 12th he is in quadrature with the sun, and is due south at 6 A. M. Neptune is in Gemini. On the 19th he is in quadrature, but since he is 90 deg. east of the sun, while Uranus is 90 deg. west of him, the two planets are in almost exactly opposite parts of the heavens.

THE MOON.

Last quarter occurs on the morning of the 2d, new moon on the afternoon of the 9th, first quarter on that of the 16th, full moon on the evening of the 23d, and last quarter again on the night of the 31st, or, properly speaking, on the morning of April 1, since the phase occurs at 1 A. M.

The moon is nearest us on the 13th, and farthest off on the 1st. She is in conjunction with Uranus on the 3d, Saturn on the 5th, Jupiter on the 6th, Venus on the afternoon of the 7th, Mercury the following night, Mars on the 11th, Neptune on the 16th, and Uranus again on the 30th. None of these conjunctions are close except that with Venus, which will be about 1½ deg. south of the moon.

At 8 A. M. on March 21 the sun enters the sign of Aries, and, according to the almanac, "spring begins."

Princeton, February 18, 1902.

EARTH TELEPHONE EXPERIMENTS OF M. DUCRETET.

M. E. Ducretet, a well-known electrician of Paris, has been making some interesting experiments in telephonic transmission by using the earth alone as a conductor. The transmitter in this case consists of a microphone and a few cells of battery connected directly to two earth plates of considerable surface and buried 6 feet below the ground. The plates are placed facing each other and only a few yards apart. For the receiver he makes use of a quarry well about 60 feet deep which communicates below with the Catacombs. The orifice terminates at the ground level by a cast-iron pipe 4 inches in diameter and 12 feet long. An insulated conductor descends in the vertical well and brings a metal sphere 3 inches in diameter in contact with the soil of the Catacombs. On coming out of the well the wire is fixed to one end of an ordinary telephone receiver, whose other end is connected with the iron pipe at the surface of the ground. The two earth circuits which are thus made are separated by a building with cellars and thick walls, and therefore the layer which separates the two parts is considerable. When the microphone is spoken into, all the vibrations of the voice, even the feeblest, give rise to variations of current in the circuit which is closed through the earth, without any metallic connection between the two parts, and in spite of the multiple variations of the currents and the nature of the medium, earth, which is used, the reproduction of the voice is made at the receiving end with remarkable sharpness, and besides, there are none of the extraneous noises which are so common in the ordinary circuits. The dynamos which are working in the neighboring building, both continuous and alternating current, have no effect upon the circuit. It is difficult to give a satisfactory explanation of this phenomenon of earth transmission, but M. Ducretet thinks that the current is diffused from the transmitting station by derivations from the principal circuit between the plates, and that this current is sufficient to operate a certain number of receivers placed at different distances. With the arrangement of circuits described above, the experimenter was able to send through the earth a current sufficiently strong to operate a relay and electric bell. If the sphere which rests upon the soil of the Catacombs is raised from the ground, all reception ceases, but recommences when the contact is again made with the earth, which, it should be remarked, is dry. M. Ducretet is continuing his experiments over greater distances and under varying conditions.

SCIENCE NOTES.

The North German Lloyd steamer "Krefeld" has just brought to Germany 175 ancient Chinese bronze guns, which formerly stood on the walls of Pekin, and, according to inscriptions upon them, were cast between 200 and 250 years ago in Chinese arsenals under the superintendence of the Jesuits. It is stated that the more highly ornamented pieces of cannon are to be placed in the Naval Museum, while the remainder are to be melted for the sake of the bronze.

M. Sibillot, a Parisian aeronaut, has devised a new principle of aërial navigation which, he anticipates, will solve the problem of traveling through the air. He has completed the plans of a new dirigible balloon which, he maintains, will be manageable in any weather. He proposes to carry in his aerial machine a refrigerator and a heating apparatus. By simply pressing a lever of the former he thus reduces the temperature of the gas, the condensation causing the balloon to descend. On heating the hydrogen the gas expands, and thus the balloon ascends. By this alternative heating or cooling of the gas in his balloon he can rise or fall at will without allowing any of his hydrogen to escape.

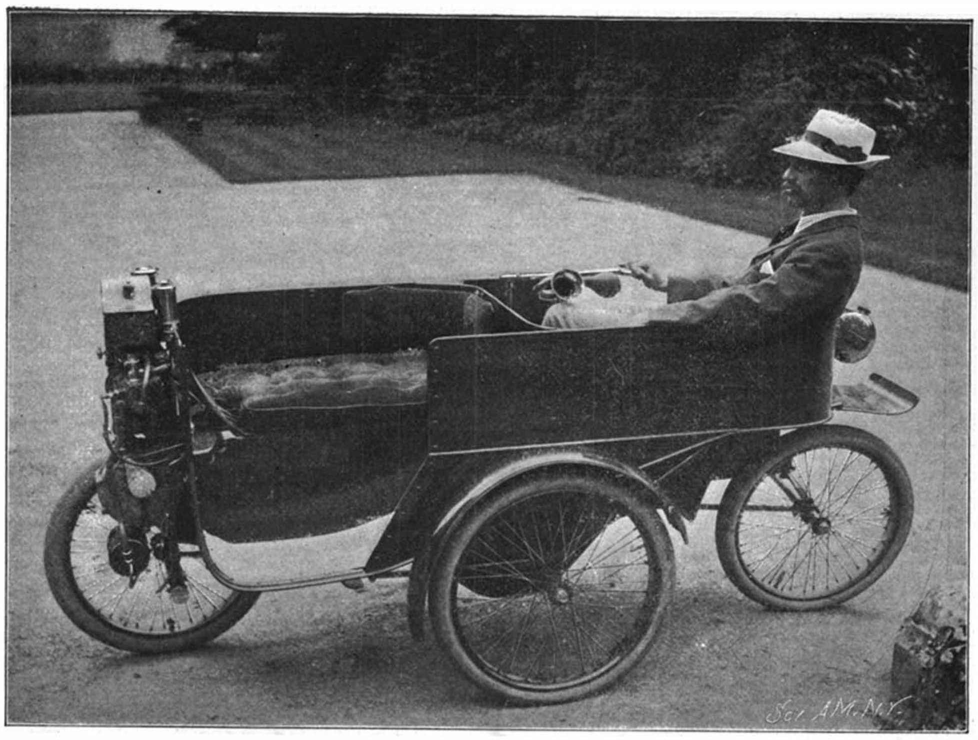
Australia is proving a formidable rival in the butter industry of the world, and the rapid growth of the export trade of that country has advanced steadily during the past few years. From the colony of Victoria alone there were exported to Great Britain during 1899-1900 17,107 tons, representing a gross value of $8,023,000. The export of butter from Victoria commenced in 1889. During the first year the quantity exported was 369½ tons, representing a monetary value of $255,000. In the following year it had risen to 759¼ tons, of a value of $495,000. The remarkable growth of the industry continued during the succeeding years, and as the demand for the article is so great there is every appearance of the colonial produce supplanting that of other countries, especially when the rich and extensive pastoral resources of Victoria are remembered. For the ten years during which the trade has existed the total exports of butter have reached 79,426 tons, aggregating a value of $38,533,475.

Dr. A. Wynter Blyth, barrister-at-law and medical officer of health for Marylebone, had a startling proposition to make in his capacity of new president of the Incorporated Society of Medical Officers of Health, who held their annual gathering at the Hotel Cecil. In his presidential address he discussed the subject of "Ventilation" in all its bearings, says the London Chronicle. To improper ventilation he attributed the low state of public health, which conduced to the spread of tubercular and other maladies. After dilating upon the atmosphere and excellent ventilation of the tube railway, he said it was within the possibilities of modern science to make the deepest mine not only habitable, but agreeable and healthy. It might be hereafter a contribution to the solution of the housing question to build downward in the depths instead of upward on the mountain. One could imagine a Jules Verne cavernous city, where the sky was the ever-white, changeless chalk, where no rain fell, where no frost penetrated, where the light never failed, and where dry, warm, filtered, purified, ozonized air bathed the lungs and fanned the cheeks of the denizens in the constant white glare of a never-dying summer's day. In tenement-houses and workplaces it was better to deal with each individual room and give them their own ventilating system. With regard to the ordinary tenement-house it was doubtless at the present time hopeless to suggest any mechanical appliance. They must seek the great factor in the propagation of tubercle in the constant breathing of bad air added to close contact of the healthy and diseased. If some of the great expert talent now employed in the investigation and discussion of problems relating to sewage and sewage-disposal were diverted to the study of ventilation, our factories and workshops would put out more work in a given time, and the mean duration of human life in the country would be appreciably lengthened.

A NEW TYPE OF MOTOR CAR.

An entirely novel form of voiturette has recently been patented and put to practical test in England by M. Maberly-Smith, of Penshurst, Kent, the construction of which involves one or two new principles.

The illustration gives a general idea of the vehicle, and demonstrates that although the car is tandem in form, the occupants, who have considerable seating accommodation, are so arranged that the driver, who controls the car from the rearmost seat, has a clear view of the road as well as the advantage of sociability with the foremost occupants. The position of the steering rod, starting handle, belt controller, and other small levers directly in front of the driver is also to be noted.



A NEW TYPE OF MOTOR CAR.

The main feature in the construction of this vehicle is the central trough or hollow keel, which contains practically the whole mechanism; in the latest pattern even the steering rods are inclosed within this keel, while the belt, pulleys, and chains are kept dry and free from dust, so that they work under ideal conditions. The engine alone with its carbureter is not inclosed, but is mounted on the extreme end of the keel and has the full advantage of the cooling influence of the atmosphere.

The keel is practically the frame of the car, and to this is attached the bent-wood construction which forms the backs and footboards of the seats.

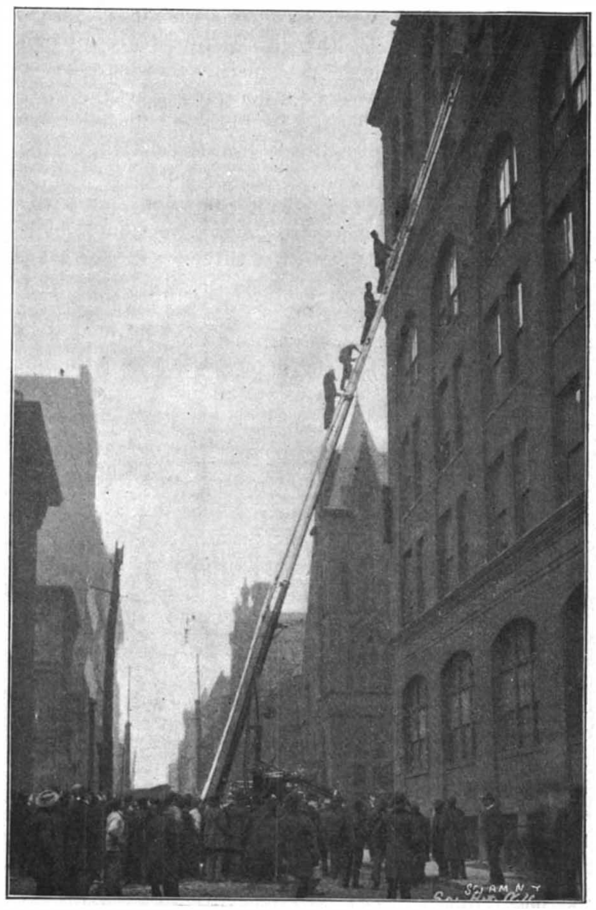
The wheels, as will be seen, are placed in diamond form, though the two steering wheels, having their position one at each end of the keel, are not actually in the same line. The reason for this is perhaps not at first obvious. In reality, however, the compactness of the design entirely depends upon this vital point, as by this means the transmission is rendered central, and the steering wheels coming immediately below the weight they have to support are permitted ample room for locking; in fact, the car can turn within a radius of 10 feet, partly owing no doubt to the duplicate method of steering, which has among other things entirely abolished the tendency to side slip so commonly found in motor vehicles. Some of the cars were recently exhibited at the Crystal Palace National Show, fitted with a 2¾ horse power De Dion water-cooling engine, which has been found to give ample power even with the two speeds with which the cars are now furnished. Gasoline is not the only power suited to this type of car, however, its extreme lightness of four hundred weight, including tanks, engine, and accessories, rendering it suitable for electric propulsion, which is now in contemplation. It is thought there will be sufficient room to carry the batteries within the central trough before mentioned.

A PNEUMATIC FIRE ESCAPE AND TOWER.

BY WILLIAM S. CRANDALL.

All things considered, the city of Pittsburg has in many respects the most up-to-date fire department in the United States. Its latest acquisition is a pneumatic telescopic aerial truck. This is the first piece of apparatus of its kind in America. It has been used for the last five years in the leading European cities and is the invention of a German scientist.

It was given a successful test the other day in Pittsburg, when it lifted from one to three men, each with a section of hose, to any particular window desired in a five-story building. The apparatus is worked by compressed air. This is a great advantage over the old style, as much valuable time is saved. The ordinary aerial truck cannot be utilized to as good advantage as this new invention. A tank of 300 pounds pressure supplies the force to shoot a heavy ladder into the air. Another smaller tank of 100 pounds pressure makes it possible to use it on buildings on either side of the street, so that although the ladder is 85 feet high, and would appear cumbersome and unwieldy to the uninitiated, yet it can be managed with the greatest ease and accuracy. The truck on which the ladder is mounted weighs 10,000 pounds, which does away with all danger of tilting. The wheels are fitted with rubber tires and roller-



THE PNEUMATIC AERIAL TRUCK IN OPERATION.

bearing axles, and the truck can be easily drawn by two horses. There is a chemical fire engine and water tower equipment in combination, together with ladders and the usual assortment of fire-fighting tools.

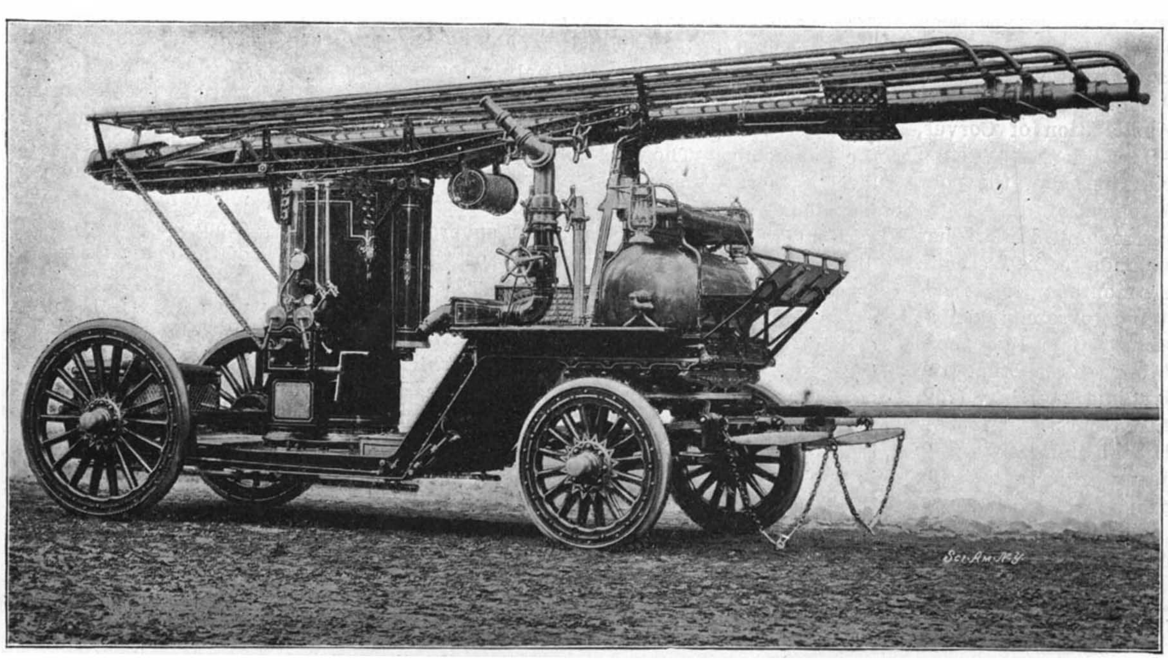
When it is desired to enter a certain window in a burning building, whether it be in the first or fifth story, a fireman is securely fastened to the top of the telescopic tube, when the first section is extended into the air, two men being required to operate the machine, one freeing the big tank from air, while the other applies the air to the tubes. Then the second, third and fourth sections are raised in the same manner, the time consumed in the operation being much less than it takes to tell about it.

While the piece of apparatus is exceedingly valuable in fighting fire in tall buildings, yet its principal use will be that of a life saver. To step out of a fifth-story window on to the top of an aerial ladder is a ticklish piece of business. To descend such a ladder is still more difficult and trying to the nerves of those who have not had the training of a fireman. To a woman the ascent or descent of a ladder, with her unmanageable skirts, the situation is still more difficult, and especially so when danger threatens and one is surrounded by flame and smoke. The use of this pneumatic ladder does away with all of these nerve-racking ordeals, making the descent from the window of a burning building a comparatively simple experience. At the top of the ladder is a little platform, and a fireman is always at hand ready to assist the person in danger from the window to the platform. Then one section after another of the tube is telescoped, and the person brought safely to the ground without any of the harrowing experiences incident to the descent of a long ladder.

No doubt the introduction of this expensive pneumatic ladder into the Pittsburg department will be rapidly followed by other large cities of the United States. In those cities outside of New York, Chicago and Philadelphia this mode of rescuing people from burning buildings would be possible in almost every instance; but in the cities mentioned, where the business blocks and apartment houses range from eight to sixteen stories high, it would be practically useless. In such cases the scaling ladder, as employed by the New York Life-Saving Corps, would be the only available substitute. But in the smaller cities, where nearly all the buildings are five stories in height or less, the new apparatus can be used to the greatest advantage.

There is really greater need for life-saving apparatus in this country than in Great Britain or the continent, for the reason that the building regulations in many American cities are either defective or loosely enforced as compared with those on the other side of the Atlantic. Here, in some cities the most flagrant abuses of building laws are tolerated, and little attempt is made to regulate the little points of detail, such as the use of matches, location of gas jets, proper installation of electric wires, proper care of chimneys, and the like. Most of our large cities have a more or less complete set of rules regulating these matters, but politics enter into the administration of a city's affairs so largely that they frequently nullify the efficiency of such rules. In London if a chimney burns out a fine is imposed upon the property owner, whether it happens to do any damage to surrounding buildings or not. The law is enforced for the purpose of making people careful to keep their chimneys clean, in order to avoid the possible conflagration.

Owing to the lax methods for fire prevention employed in this country, the annual loss by fire is far greater than that of the Old World. While we have great reason to be proud of the efficient fire service in American cities as a whole, yet it needs to be the more perfect because of the greater number of fires and the greater menace to public property.



PNEUMATIC, TELESCOPIC, ELECTRICALLY-INSULATED, AERIAL HOOK-AND-LADDER TRUCK.

Emperor Wilhelm has presented his yachts "Meteor" and "Comet" to the German navy. The "Meteor" is for the use of the naval officers at Kiel and will be renamed the "Orion," while the "Comet" is for the use of the officers at Wilhelmshaven.

TEST OF THE NEW FLOATING DRYDOCK AT ALGIERS, LA.

BY FREDERICK MOORE.

We present an illustration showing the recent test of the new floating dock at Algiers, La., by docking the new battleship "Illinois." This vessel is a sister ship to the "Alabama" and "Wisconsin." She is of 11,565 tons displacement, 17.4 knots speed, and carries four 13-inch, fourteen 6-inch, and twenty-eight smaller guns. She was built at the Newport News shipbuilding yard.

When the late war was imminent, the Spanish government placed an emergency contract with Swann & Hunter, Wallsend on Tyne, for two floating docks of 10,000 tons capacity, and offered premiums to the builders and the towing contractors for the completion and delivery of these docks respectively to Manila and Havana, in the way of several thousand pounds sterling for each month that the contractors clipped from the contract time of delivery. In just eleven months from the date of the contract the now famous Havana dock was delivered at that place. It cost the Spanish government $595,000, $150,000 more being paid for towage and premiums. It arrived in Havana about two months before the blowing up of the "Maine," and served the few Spanish cruisers then about Cuba in getting into condition for the war. Unfortunately for Spain, the dock was misplaced. Had it been sent to Santiago, Cervera's fleet would have been able, at least, to have made a better run, for their bottoms would all have been cleaned and scrapped.

The other dock was not finished until after war had begun, and after the declaration of peace it was taken to Port Mahon, Balearic Islands.

By the treaty of peace it was agreed that all movable property belonging to the Spanish government might be taken away. The board appointed to pass upon movable and immovable property declared the Havana dock movable; but Spain had no use for it, in her comparatively shipless state, and sold it to this government for the paltry sum of $185,000. Although we had no occasion to dock our battleships during the campaign, considerable uneasiness was experienced over the fact that in all the southern waters there was no dock large enough to take an American battleship. A small floating dock had been towed to Pensacola; and Key West, Mobile and New Orleans had docks that would lift torpedo boats and small cruisers; but there was no dock south of Newport News able to accommodate one of the government's larger ships.

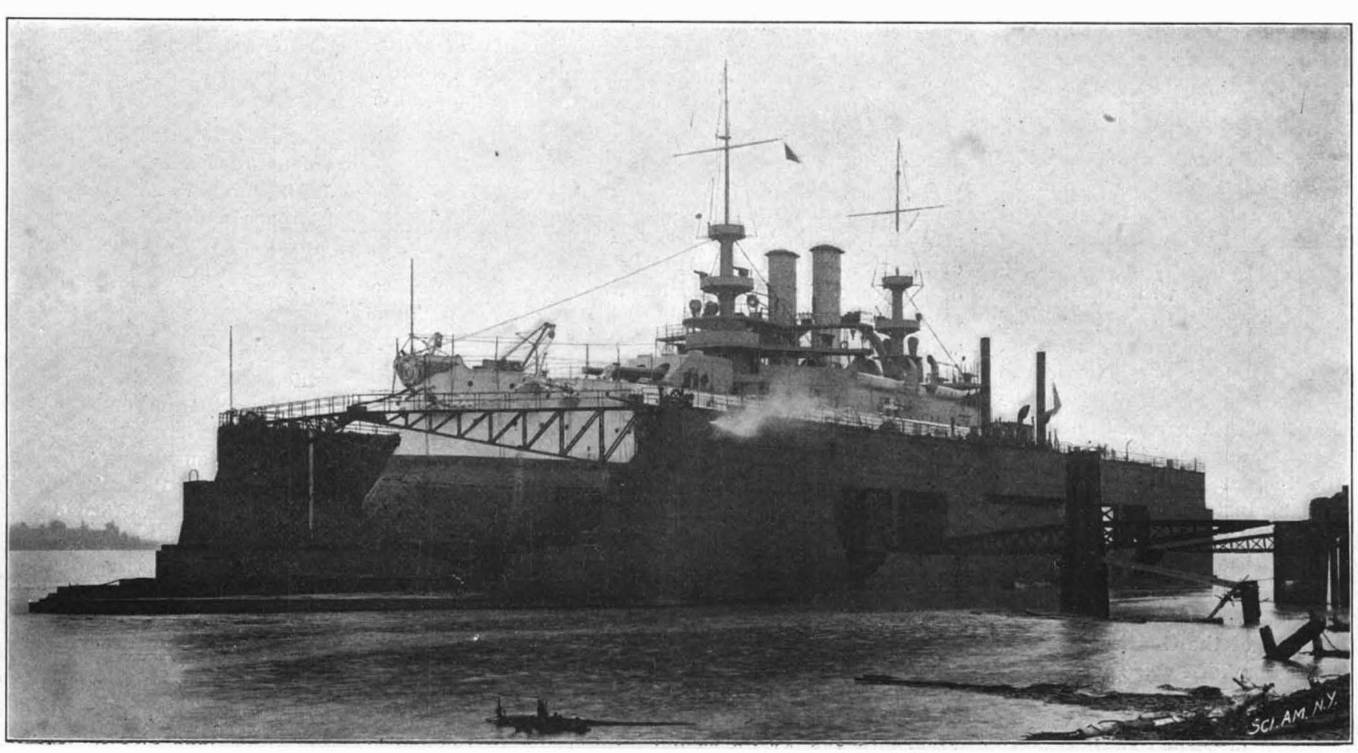
Immediately after the war, a contract was awarded for the building of a floating dock for Algiers (just opposite New Orleans) that would lift any vessel in the navy. This was to be the largest dock of its kind afloat, 15,000 tons capacity with decks two feet above water, 18,000 tons awash. In October the dock was successfully towed from Sparrow's Point, Maryland, its place of construction, to New Orleans. This style of dock was decided upon for three reasons: First, because a graving dock could not be built in a stable way in the alluvial soil of the Mississippi's banks; secondly, because of the variation of 18 feet in the river levels at high and low water; and thirdly, because of the cheapness of first cost (one-third less) and of maintenance, as compared with stone docks.

The test of the full capacity of the dock could not be made, for the reason that the "Illinois" displaces only 11,565 tons; but the test of that lift was entirely successful and satisfactory.

The Havana dock is being put in thorough repair, and will very likely be towed to Manila to augment the naval station there.

Under the terms of the contract a two days' sea trial was lately made by the "Illinois," when the ship was thoroughly inspected by the naval board and was found to be in every respect satisfactory.

The "Illinois" will be the flagship of the European squadron that will represent the navy at King Edward's coronation.



BATTLESHIP "ILLINOIS," TESTING THE NEW FLOATING DOCK AT ALGIERS, LA.

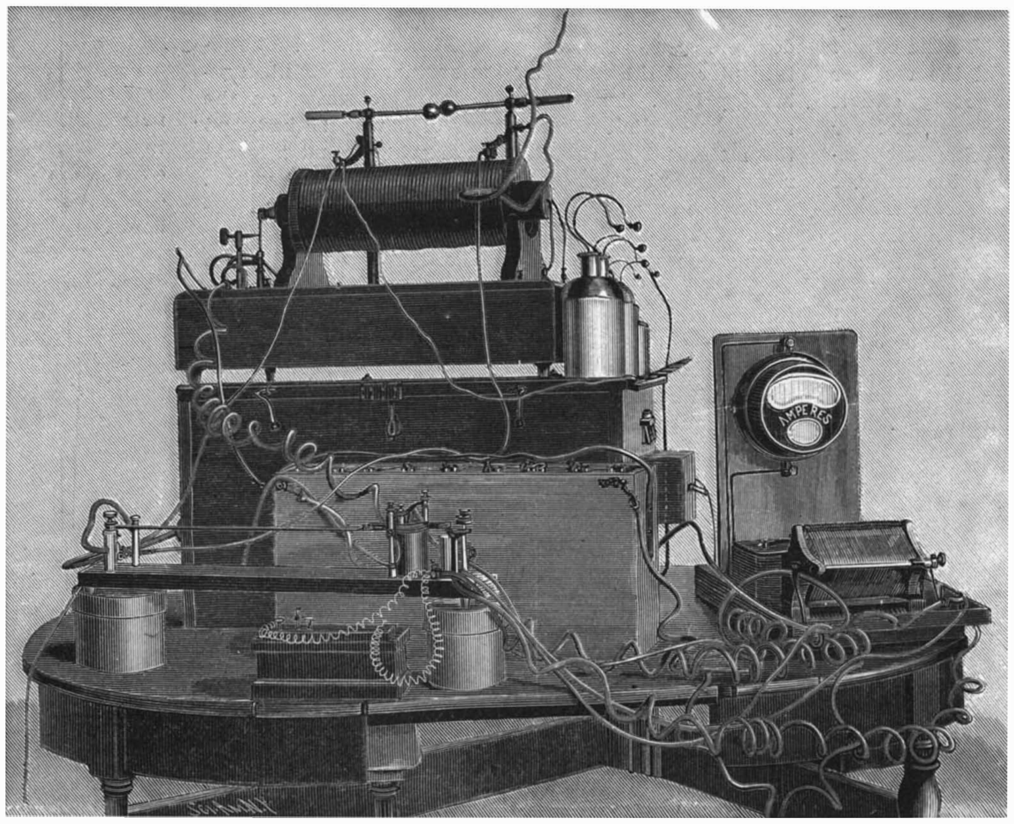
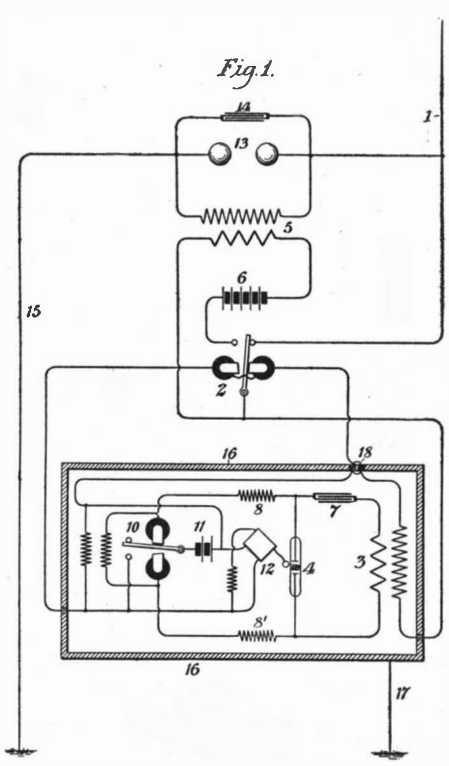


Fig. 2.—THE GUARINI WIRELESS TELEGRAPH REPEATER.



DIAGRAMMATIC VIEW OF THE GUARINI WIRELESS TELEGRAPH REPEATER.

THE GUARINI REPEATING WIRELESS TELEGRAPH SYSTEM.

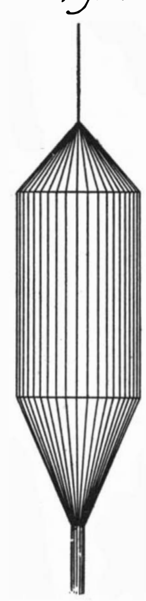
BY A. FREDERICK COLLINS.

Nearly all the work done in wireless telegraphy since its practical introduction in 1896 has been along lines having for their ultimate purpose one of two objects—the first, to cover distance, and the second, to produce a tuned or syntonized system. Occasionally, however, one's attention is drawn to some investigation original to the art, or an invention involving new thought. Among these may be cited the steering of dirigible torpedoes, controlling clocks, block-signal systems and repeaters for wireless telegraphy.

This latter device is the invention of M. Emile Guarini, of Brussels, Belgium, who has directed his energies toward the problem of overland transmission, and to carry his ideas into practice he installed standard equipments at Brussels and Antwerp and his repeating device at Malines.

It is well known that the propagation of long electrical waves over wires may be effected to great distances, but over submerged cables—owing to the excess of capacity and the decrease of inductance—the distance of effective rapid transmission is exceedingly limited. Oppositely disposed to these conditions is the action of electric waves used in wireless telegraphy, for an apparatus capable of sending waves 100 miles by sea, will not propagate waves one-fourth that distance on land.

Fig. 3.



GUARINI ANTENNA.

This was the state of affairs confronting Guarini when he resolved to operate between Brussels and Antwerp—the two cities being, practically, 25 miles apart; and what made the problem still more difficult, was the intervening ground, which attained a considerable elevation. On one of the highest eminences Malines is situated midway between the two cities, and it was here the messages were to be repeated automatically.

With this plan well in mind the inventor constructed a transmitter and a receiver, and by cleverly combining them obtained a repeater capable of retransmitting a message by utilizing fresh electromotive force and sending out re-energized electric waves. In the wire system there is nothing more simple than the repeater, or relay, as the apparatus proper is called, which, by means of a delicately poised armature throws a local battery in or out of circuit; but current electricity and electric waves must not be confounded one for the other, for current electricity is transmitted by the bound ether or conductors, whereas electric waves are propagated by the polarizations of free ether, i. e., like light waves. Therefore when a repeater is contemplated for wireless telegraphy the apparatus becomes a complicated affair, though to a casual observer it would seem comparatively simple to construct such an apparatus. Therein lies the credit due Guarini. Let us imagine a wireless transmitter, and by this we mean, a Ruhmkorff coil, Morse key and suitable battery; let us also imagine a receiver or combination of coherer, relay, sounder and batteries, and both transmitter and receiver connected to proper antennæ and ground. Now combine the two instruments, so that the sounder will close the primary circuit of the induction coil. What will be the effect? The first waves reaching the antenna of the receiver from a distant point will close the relay circuit through the coherer; this draws down the sounder lever and closes the circuit of the coil, rendering it operative, and the instant the spark passes, the emitted waves that should be outgoing and the feeble incoming ones conflict, the former annihilating the latter, the coherer is "choked" and chaos must inevitably result.

Guarini knew all this full well. How he bridged over the serious difficulties, as well as the minor ones, will follow; suffice it for me to say that it required time, perseverance and money, the latter to the extent of nearly $10,000, before the repeater reached its finally perfected state.

The combined transmitter and receiver for relaying messages automatically at Malines is shown in the diagram, Fig. 1; the antenna, 1, is connected with the coherer, 6, through the aerial switch or relay, 2—which serves as the transmitting key—and through the primary of the small induction coil, 3, whence it leads to the metal box, 16, and is fastened to it securely at 18; the metal box employed to shield the coherer and delicate receiving apparatus from the powerful radiations of the Ruhmkorff coil, 5, now conducts the received waves to 17, where they pass into the earth. It will be seen that the lever of the switch, 2, is thrown toward the antenna, 1, and this permits the waves to pass freely to the coherer and thence to the earth; but when this occurs the coherer operates the internal circuits and causes the lever of the switch, 2, to be thrown to the left, so that no more waves may pass to the receiver. Now when the lever of 2 is drawn to the left it closes the circuit of the primary of the Ruhmkorff coil, 5, and the battery, 6. Then the spark passes at the gap, 13, one of the spark balls of the gap, 13, leading to the antenna, 1, and the other to the ground, 15. This disposes of the external or wave systems, as the antennæ and grounds are termed, and it is only needed to describe the internal or current systems operating the coherer tapper, 12, and the relay, 10.

The coherer, 4, is not in series with the antenna, 1, or the ground, 17, direct, but is operated by means of an induction coil like that employed in telephony. The coherer is in circuit with the secondary of the coil, 3; in this circuit is the condenser, 7; in shunt with the coherer circuit is a second circuit acting through the choking coils, 8 and 8[1], and the battery, 9, which, when the coherer drops in resistance, operates the relay, 10. Now, when the relay, 10, is closed, it causes the tapper, by means of the battery, 11, to decohere the filings. There are variable resistances employed to obtain a better electrostatic balance in the circuits, for cutting down local inductive effects and for supplying additional resistance to the coherer.

The secondary terminal of the transmitter coil, 5, leads to the spark gap, 13, and to the condenser, 14. The condenser is for the purpose of "tuning" the system. By this it is not intended to convey the impression that the different stations are in tune with each other, but that portions of the apparatus must be in tune with other portions. Thus if the coil give normally a 12-meter wave length, then the inductance and capacity of the antenna should be made to conform with it as closely as possible.

The function of the repeater is this: When the enfeebled waves from the Antwerp or the Brussels station reach the antenna they set up oscillations in the wire extending through the rélay, 2, to the coherer, 4, by means of the coil, 3; this closes the internal circuit, and drawing down the armature of the relay, 10, brings in contact the second internal circuit shown by the heavy lines and leading to the external relay, 2, or, as Guarini terms it, an aerial switch, since it takes the place of the Morse key and controls the emission of the waves from the Ruhmkorff coil as well as the reception of the waves by the coherer. It is evident that when the armature of the relay switch, 2, is drawn to the right, or in contact with the antenna as shown in the diagram, the coherer will receive the waves, while oppositely, the primary of the Ruhmkorff is broken and therefore no waves can be emitted. When the armature of the switch, 2, is drawn to the left, no waves may be received, but waves will be emitted. It is well known that in a wireless telegraph receiving device, there is an appreciable amount of time consumed from the instant the coherer is impressed by the wave, and the instant the lever of the sounder is drawn down; added to this is the inertia of the aerial switch lever, 2, and the magnetic lag of the coil, 5, so that the waves may be easily received before the re-energized wave is emitted.

Fig. 2 is from a photograph of the Guarini standard repeater at Malines. The Ruhmkorff coil shown gives a 10-inch spark, the E. M. F. supplying it being derived from eight storage batteries giving a current of from 6 to 9 amperes. When in operation the spark gap is cut down to 6/10 of an inch. The condenser, 14, shown in Fig. 1, is formed of a battery of five Leyden jars seen to the right of the coil in Fig. 2. The interrupter of the coil is of the ordinary mechanical vibrating type. The aerial switch is elevated on the round boxes, that a better view of it may be had, and the metallic box, containing the coherer and internal relay, tapper and coils sets just below the aerial switch. Under the ammeter is a slide wire resistance for regulating the flow of current to the large coil.

The object of the small induction coil, 3 (Fig. 1), which, according to Guarini's terminology, is a transformer, is to prevent the atmospheric electricity which gathers on the aerial wire or antenna from influencing the coherer, as the difference of potential between the earth and aerial wire is always considerable and gives much trouble in actual practice. This is one reason for using a Morse printing register in wireless telegraphy in preference to the ordinary sounder. On a tape it is much easier to decipher the impressions made by the wireless waves and to differentiate them from those produced by the difference of potential between the earth and the upper strata of air. By those who are versed in the technique of wireless methods it is comparatively easy to know which are wireless waves and those due to local disturbances.

The coherer Guarini employs is of the Blondel type, having large nickel filings with traces of silver inclosed in 1 mm. space, the glass tube then being exhausted. The circuits are so arranged that when the tapper decoheres the filings an additional resistance of 2,000 ohms is added, which with the resistance of the coherer, measuring 1,100 ohms, makes this a total of 3,100 ohms. The object of this additional resistance is to cause all the current from the battery to flow through the operating appliances, to the exclusion of the coherer after it has accomplished its initial function.

The antenna Guarini employs is made of a cable of seven wires, 9 mm. in diameter each (Fig. 3), with a cylindrical extension 33 feet long made of 50 parallel wires, having a cross section of 50 centimeters.

In 1900 Guarini submitted to the Academie des Sciences of Paris his theory that the antenna radiates electric waves exclusively in planes normal to its surface. He has written extensively on the role the antenna plays in the emission of waves as well as the role of the earth.

Guarini received the help of the Belgian government in his experiments and was assisted by Artillery Lieut. Ferdinand Poncelot. In Brussels the antenna was attached by bamboo poles to the Column of Congress; at Malines to the tower of St. Romhaut, and at Antwerp to the tower of Notre Dame. The antennæ were 90 feet in height.

The subject of wireless transmission is a fascinating one, but is yet in its incipiency, its possibilities practically unlimited, yet with such improvements for rapid and long distance telegraphy as the Delaney, the Mercadier and the Pupin systems, much improvement must be in order before the securities of the air wire companies will begin to decline.

Narberth, Pa., January 8, 1902.

Antarctic Explorations.

On the evening of February 17, 1902, at the Waldorf-Astoria Gallery in this city, under the auspices of Major J. B. Pond, C. E. Borchgrevink, the Norwegian explorer, gave an entertaining lecture illustrated by views made by himself of the first exploration of the Antarctic continent undertaken in 1898-1900, which was backed up by English capital.

The experiences were similar to those of the Arctic regions. In winter (there in July), the thermometer would average 72 deg. below zero, southeast gales were prevalent and would arise, accompanied at times with snow, very suddenly and prevail with great velocity. The land he discovered appeared to be of volcanic origin, was very precipitous, rising five to six thousand feet or more above the sea level, and on the top very little snow was found. The extreme south latitude he reached was 79. deg. 85 min., and views here showed icebergs and glaciers of tremendous size and of strange appearance. He described the breaking off of an iceberg from a glacier which was so immense that in its sudden immersion a great wave resulted which temporarily submerged him as it washed up against the shore where he was standing.

The seals and penguins were in abundance and very friendly. The penguins enabled him to determine in advance when a southeast gale was approaching, as he observed they all turned their heads in that one direction long before it arrived.

He described the method of fishing through the ice without bait, and secured specimens of new species of fish. He took with him two Laplanders and many Esquimaux dogs; these he found very serviceable in making short sledge expeditions from the base of supplies.

In the Antarctic winter the same brilliant electrical display appeared in the southern heavens that is observed in the Arctic region. Referring to the movements of immense icebergs he noticed they would go many times in a direction opposite to the surface tide and against the wind, showing that there must exist a deep counter undercurrent. He traveled two thousand miles south of Queensland, Australia, in a steamer named "The Southern Cross," landed on an island there, erected special houses and lived there with nine others, allowing the steamer to return. The vessel called for them again in 1900 and brought them home.

Work in the Field of Wireless Telegraphy.

News comes from London that it was decided at a meeting of the Marconi Wireless Telegraph Company to transmit words and messages across the ocean during the next series of experiments.

Marconi, who was present at the meeting, announced that there was nothing to prevent his company from more widely introducing his system of telegraphic communication at sea. At the present time the Marconi system is in use on some seventy ships. About twenty-five land sections have been established. A speed of transmission of about twenty-two words per minute has been obtained; the work of the cables is not very much faster. With his syntonic system Marconi hopes to secure that absolute secrecy, the lack of which has been one of the most formidable criticisms leveled at wireless telegraphy. So confident is Marconi of his ultimate success in attaining this end that he publicly challenged Sir William Preece and Prof. Lodge, both of whom are well-known investigators in the same field of research, to "tap" his wireless messages.

In Germany the Slaby-Arco system of wireless telegraphy, which is a modification of Marconi's, is rapidly being introduced. The German Navy Department has decided to establish a chain of wireless telegraph stations along the entire German coast. Up to the present time thirty-two German warships have been fitted with the Slaby-Arco apparatus. The number will soon be increased to forty. In Germany it is claimed that the improvements of Prof. Slaby and his intimate friend and collaborator, Count Arco, have done much to increase the distance through which the Hertzian waves can be transmitted. The claim is open to some criticism.

International Congress of Americanists.

The Thirteenth Session of the International Congress of Americanists will be held in the halls of the American Museum of Natural History, New York city, October 20 to 25, 1902. The object of the Congress is to bring together students of the archæology, ethnology, and early history of the two Americas, and by the reading of papers and by discussions to advance knowledge of these subjects. Communications may be oral or written, and in French, German, Spanish, Italian, or English. All debates are expected to be brief, and no paper must exceed thirty minutes in delivery. The papers presented to the Congress will, on the approval of the Bureau, be printed in the volume of Proceedings. Members of the Congress are expected to send, in advance of the meeting, the titles, and, if possible, abstracts of their papers to the General Secretary. The subjects to be discussed by the Congress relate to: I. The native races of America, their origin, distribution, history, physical characteristics, languages, inventions, customs, and religions. II. The history of the early contact between America and the Old World. All persons interested in the study of the archæology, ethnology, and early history of the two Americas may become members of the Congress by signifying their desire to Mr. Marshall H. Saville, General Secretary of the Commission of Organization, American Museum of Natural History, New York. Mr. Morris K. Jesup is president and the Duke of Loubat vice-president of the Commission of Organization.

The Current Supplement.

The first article in the current Supplement is devoted to the Madonna San Antonio, purchased by Mr. J. P. Morgan. An illustration of the picture in question accompanies the article. "The Naming of Our War Vessels" is continued from the last Supplement. A new method of water sterilization by means of ozone will undoubtedly be of interest to sanitary engineers. Major P. Cardew discourses very lucidly and entertainingly on polyphase electrical railways—a subject of which only too little is known in this country. "The Mechanical Handling of Baggage" is the title of an article describing a new installation in Paris. Prof. W. F. Watson has an illustrated description of a darkroom, the ventilation of which is all that can be desired. William T. Hornaday, of the New York Zoological Garden, has an article on the Mountain Sheep of North America; two illustrations accompany the description. The usual consular and trade notes will be found in their customary places.

Dr. Sven Hedin announces that he was attacked by Thibetans during his recent journey, and that all of his collections and almost the whole of his caravan was lost, but fortunately he was able to save his notes.

Correspondence.

A Bird Tragedy.

To the Editor of the SCIENTIFIC AMERICAN:

Several persons waiting for a Brooklyn Bridge car a few days ago saw a battle royal between a number of English sparrows that ended in the electrocution of four of the little warriors. The fight took place in the Manhattan end of the bridge, where the bridge cars are switched from one track to the other. It was during a dull hour in the morning, and but few persons were watching the feathered fighters when the tragedy occurred.

As all who travel on the bridge know, the third rail runs through the bridge, and in the yards at this point is labeled in large white letters on a red background "Dangerous." Between trains a score of angry sparrows flew beneath the roof, making a great noise and attacking one of their number with great fury.

As several of the birds lit on the third rail and the track rail next to it, the mass of little fighters rose clinging to one another, all pecking and chirping. In this way a circuit must have been formed, for suddenly there was a blinding flash that made the spectators close their eyes and which attracted the attention of one of the guards, who ran to the spot. He found two of the birds had been burned to a crisp. One was singed badly, and another was dead without a mark on it. Two others which had been stunned fluttered away before they could be caught.

24 Garden Place, Brooklyn. E. W. KELLY.

Power from Rivers.

To the Editor of the SCIENTIFIC AMERICAN:

With the method of obtaining power from river currents described by your correspondent in your issue of January 25, there are some, but not many, localities where the results would justify the cost.

The screw wheel or windmill universally employed for obtaining power from the wind is the cheapest appliance for obtaining power from a free stream (power from a river without building dams).

Place an ordinary iron or steel windmill wheel in a river running five miles per hour and it will yield at least ten times as much power as in the average wind and furnish force at about one-fourth the cost of steam.

When used as windmills these wheels are often idle, and at times damaged by hurricanes. In a deep river they would work all the time and never be subjected to excessive strain.

Owing to the ever-varying direction of the wind these wheels, when used as wind motors, cannot be economically grouped or massed in one spot, and are therefore available only for small users of power. But in the water enough of them can be grouped on long arms reaching out from shore or from a pier, crib or old steamboat hull to furnish 500 horse power in one spot. This is, of course, too little for some users but sufficient for the great majority and better for the people, for it would scatter them along the shore instead of huddling them in large cities.

Three hundred horse power is now taken from the current of the Danube at the Prater Ufer just below Vienna, Austria, though they have there made the great mistake of using the undershot wheel instead of a screw. A screw will furnish about six times as much power as a paddle wheeel of the same blade surface.

The full utilization of the cheap power of swift rivers would shift manufacturing centers to such an extent as to change the rank of States and nations, and would make each shore of a rapid river one continuous town. S. N. STEWART.

Brooklyn, N. Y.

Launch of the "Kroonland," the Largest American Steamer.

On the forenoon of February 20, the "Kroonland," the largest American steamship ever built was launched at Cramps' Shipyard, Philadelphia. The vessel is 580 feet long, or 26 feet longer than the St. Louis or St. Paul, and has a tonnage register of 12,000. Her speed will be 17 knots.

The promenade, the upper, and the saloon decks are utilized for the accommodation of passengers. All first and second cabin saloons and state-rooms are located amidships, where the motion is less felt than in any other part. The interior rooms, in many vessels so dismally dark as to require artificial illumination, are lighted by oval glasses.

The vessel has accommodations for 343 first-class passengers, 194 second-class passengers and about 1,000 third-class.

The launching was not accompanied without difficulty. The tallow on the ways had frozen; and the "Kroonland" had to be pushed into the water by hydraulic jacks.

Harvard University will probably send an expedition to explore Egypt, Babylonia, Assyria, and Palestine for Semitic relics.

Engineering Notes.

Consul-General Bray reports from Melbourne, November 10, 1901, that the Eastern Extension Australasia and China Telegraph Company, Limited, has notified the government of the State of Victoria that the Cape cable from Durban (Natal) to Freemantle, Western Australia, is now ready for use, and congratulatory messages have been exchanged with the government of Cape Colony, Natal, and Mauritius. The section of the cable between Freemantle and Adelaide, South Australia, is now in course of construction.

The construction of twenty new warships for the British navy has just been begun, in accordance with the recent naval estimates. Several of the vessels are being built in the royal dockyards, and the men are working overtime in order to get the arrears of work out of hand ready for the new building. The majority of the vessels are to be first-class cruisers, which the recent naval maneuvers emphasized as being urgently needed. Some dockyard extensions are also contemplated in order to increase the output of future years, to keep pace with European building. Provision is also being made for submarine construction. High speed will be developed in all of them. The orders for boilers are to be held back, owing to the investigation into the Belleville boilers by the special Parliamentary committee selected for the purpose, and whose report has not yet been delivered.

An article recently published in Lightning gives the following interesting facts in regard to Nernst glowers; "With earths like lime, magnesia, zirconia and thoria, the greater the purity the greater the conductivity at high temperatures, but by adding small quantities of certain oxides, such as those of chromium, manganese, uranium, titanium and niobium, glowbodies are produced which are more stable, can be excited at a lower temperature and have a high illuminating power. A suitable mixture is: Zirconia, 90; magnesia, 5; lime, 4; sesquioxide of manganese, 1; made into a paste with sirup and squirted into rods. The Nernst Electric Light Company, Westminster, English patent 13,839, 1900, hardens its filaments by baking at a high temperature in an electric arc between carbons separated about three-eighths of an inch. The radiating surface is increased by making the cross-section elliptical or flat, with rounded or square edges. Another form is ribbed, with or without a central hole."

The central London Electric Railway, familiarly known as the tube, contemplates extensive developments in connection with its service which will benefit the rapid transit in London to an enormous extent, and which when completed will somewhat interfere with Mr. Yerkes' Electrified Underground Railway. Last year this railroad carried 91,000,000 passengers over its short run of 6½ miles; and in view of this tremendous traffic, and the fact that it is impossible to supply a faster service of trains, owing to a certain amount of time that is lost by switching at each terminus, the company proposes to extend their system to make a complete circle. This will be accomplished by the construction of a couple of new tubes, each 8 miles in length, which will run parallel to the existing line east and west, forming a new inner circle 14 miles in length. The projected route will extend from the city terminus at the Bank via Queen Victoria Street, Upper Thames Street, Ludgate Circus, Fleet Street, the Strand, Piccadilly, straight on to Hammersmith, where it will curve round to join the present system at Shepherd's Bush Station. At the Bank terminus another station will be built close to the existing one; and in order to complete the circuit of the system there will be a loop line running from one Bank station to the other, via Liverpool Street—the terminus of the great trunk railroad serving the eastern counties of England—and St. Mary Axe. When this is done the tube will serve the busiest trade centers in the heart of London, and it will more than double the stations which now connect the city with the West End. By the construction of this extension the London termini of six of the principal trunk railroads extending to all parts of the country will be linked up. Communication between the city and Piccadilly Circus, Hyde Park Corner and other West End centers is at present only maintained by the slow omnibus. By this new route the distance will be immensely shortened, and the "Underground," even when "electrified," will lose a large portion of its West End traffic. The new tube will be constructed on exactly the same lines as the existing one, with certain minor modifications which experience has shown to be desirable. The electrical energy will be generated at the Shepherd's Bush generating stations, which supply the present system; only the machinery will be duplicated. The cost of the undertaking is estimated at $17,500,000. The fare will not be increased from its present rate of four cents for any distance. It is estimated that the work of construction can be commenced in eighteen months' time, and that it will take three and a half years to complete.

Electrical Notes.

Copper or lead in small amounts can be removed from mercury by putting it under warmed diluted nitric acid, stirred at intervals of one-half hour for four hours. Lead in larger quantities is removed from mercury by retorting, the mercury being covered to the depth of about one and one-half inches with powdered charcoal.

Consul-General Guenther reports from Frankfort, December 4, 1901: The Frankfurter Intelligenz-Blatt of this morning states that the railroad management at Cassel calls attention to the order that American petroleum is to be used only for office lamps and signal lanterns, and then only if Russian petroleum does not produce a sufficient light. The Minister of Public Works has of late repeatedly ordered that only Russian petroleum be used; stating that, as in fifteen railroad districts it has been employed with uniformly good results, it must be taken for granted that at offices from which complaints have been received the lamps have not been properly cleaned.

The London County Council, in view of the Highways Committee's favorable report on subways and "shallow" tramways, has decided to apply for the necessary Parliamentary powers to construct such means of rapid transit in London. When this has been obtained the work of construction will be commenced. The Council proposes to construct an experimental subterranean tramway from the Victoria Embankment, under the new street to Holborn, under Southampton Row, and to connect that tramway with the other routes which converge on Theobald's Road. This is the only means of satisfactorily relieving the congestion of traffic of the streets, whose surfaces are at present inaccessible for tramways. The cost of the experimental undertaking is estimated to be approximately $1,250,000.

By the recent opening of the Cape Australian telegraph cable as far as Perth, West Australia, practically the whole of the British possessions are now linked together by telegraphic communication. For this Cape Australian section, nearly 15,000 miles of cable have been used at an expenditure of over $15,000,000. By this latest achievement the whole cable between London and Australasia is in British hands entirely. By next February the cable will be extended to Adelaide. This new cable route opens a more direct means of telegraphic communication with Australia. The messages will be transmitted from London to Porthannon in Cornwall, thence straight to Cape Town via Madeira, St. Vincent and St. Helena. From Cape Town they will then be transmitted overland to Durban, the South African terminus of the new Cape Australian route, thence direct to Mauritius, Rodriguez, Cocos Island, and on to Perth, Adelaide, Sydney and New Zealand.

Judicial proceedings in the case of boiler explosions in England are very searching, and go upon the principle that some one is to blame for them; apparently every one at all connected with the disaster has to show that he personally did not cause it. In a recent case of the kind alluded to, a boiler which had been in use for periods unknown finally succumbed to the strain, causing much damage to surrounding property. In the proceedings it was found that a considerable portion of the shell was only one thirty-second of an inch thick, but the owner had called in a firm of engineers to examine the boiler and repair it. The workman told the boiler owner that he must not carry over twenty-five pounds per square inch on it, but even this did not avail to prevent accident. The counsel in the case charged that the workman had no right to make any statements as to the pressure to be carried, and the engineer firm that employed him had to pay $50 for his excess of zeal in giving any advice whatever, claiming that he was employed only to drive rivets and not to act as a consulting engineer.

A memorial to the late Sir Joseph Bazalgette, the eminent engineer who revolutionized the drainage system of London and who designed the Thames Embankment, was recently erected in London. The monument stands on Victoria Embankment opposite the fashionable thoroughfare, Northumberland Avenue. It is a mural design wrought in veined Sicilian marble, containing a portrait bust in bronze of the deceased engineer. The base of the monument, rising from a sub-base of granite, consists of a carved panel embodying in arabesque design the symbols of Science and of Labor, while the central ornament from which these enrichments spring is formed by three dolphins, emblems of the tidal river. Sir Joseph Bazalgette reconstructed the whole of the sewers of the English metropolis. He built his lines a little below the old drainage system and transferred their former outfall in the river Thames, from their original point to another at Barking and Crossness Point, 14 miles farther down the river. The magnitude of the task may be comprehensively realized from the fact that there were fifty main sewers on the north and twenty on the south side of the river. Through these drains were carried and emptied into the Thames about 31,650,000,000 gallons of sewage per year.

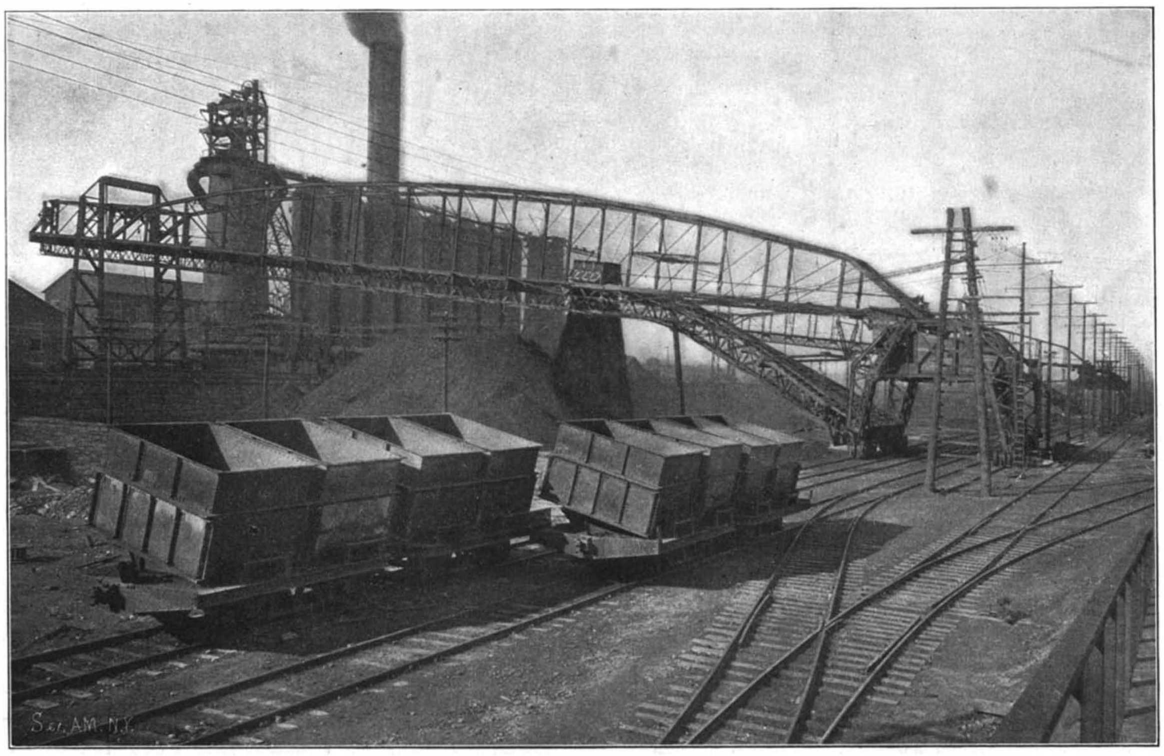
ORE HANDLING AT FURNACES.

BY WALDON FAWCETT.

In few sections of the industrial field has the past few years witnessed an advance which has been as revolutionary in its influence upon methods and equipment as in the handling of iron ore at the blast furnaces, where its conversion into pig iron constitutes the first step in iron and steel manufacture, according to the general interpretation of the term. A few years since it was the custom to transfer by hand the ore, coke, limestone and other ingredients of the furnace "charge" from the railroad cars to wheelbarrows, by which, supplemented by elevators of antiquated design, the raw material was conveyed slowly and laboriously to the top of the furnace. Under the new system mechanical devices perform automatically almost every function which was formerly dependent upon human labor.

The bridge tramways, equipped with hoisting and conveying apparatus for the movement at high speed of tubs or buckets of over a ton capacity, which have proven so successful in unloading ore from vessels on the Great Lakes, and the car-dumping machines which have come into extensive use for placing large consignments of coal on board vessels expeditiously, have both been utilized for handling ore at furnaces; and in some instances these two exceptionally interesting classes of machinery have been used in conjunction. This is the case at the plants of the National Steel Company at Youngstown, Ohio, and Mingo Junction, Ohio, and the Neville Island plant of the American Steel and Wire Company. It has been demonstrated at these institutions that under almost any conditions ore can be handled from railway car to ore-pit or from ore-pit to bins at an average of less than one cent a ton.

In order to convey an adequate idea of the scope of a representative installation of this character, it may be stated that the stock yard is from 700 to 1,000 feet in length with a width of 250 feet between opposite walls and has a capacity of from 750,000 to 1,000,000 tons of ore. The yard is spanned by two steel conveyor bridges which are the largest of their type ever constructed. Each bridge in addition to the span of 260 feet has a cantilever extension over the bins of 41 feet. Each bridge is mounted on a two-track machine tower at its outer or receiving end and on a one-track rear tower next to the furnaces. At their receiving ends the bottom chords of the bridges are approximately 54 feet above the bottom of the ore-pit and at the rear tower 80 feet, thus giving very large storage capacity.



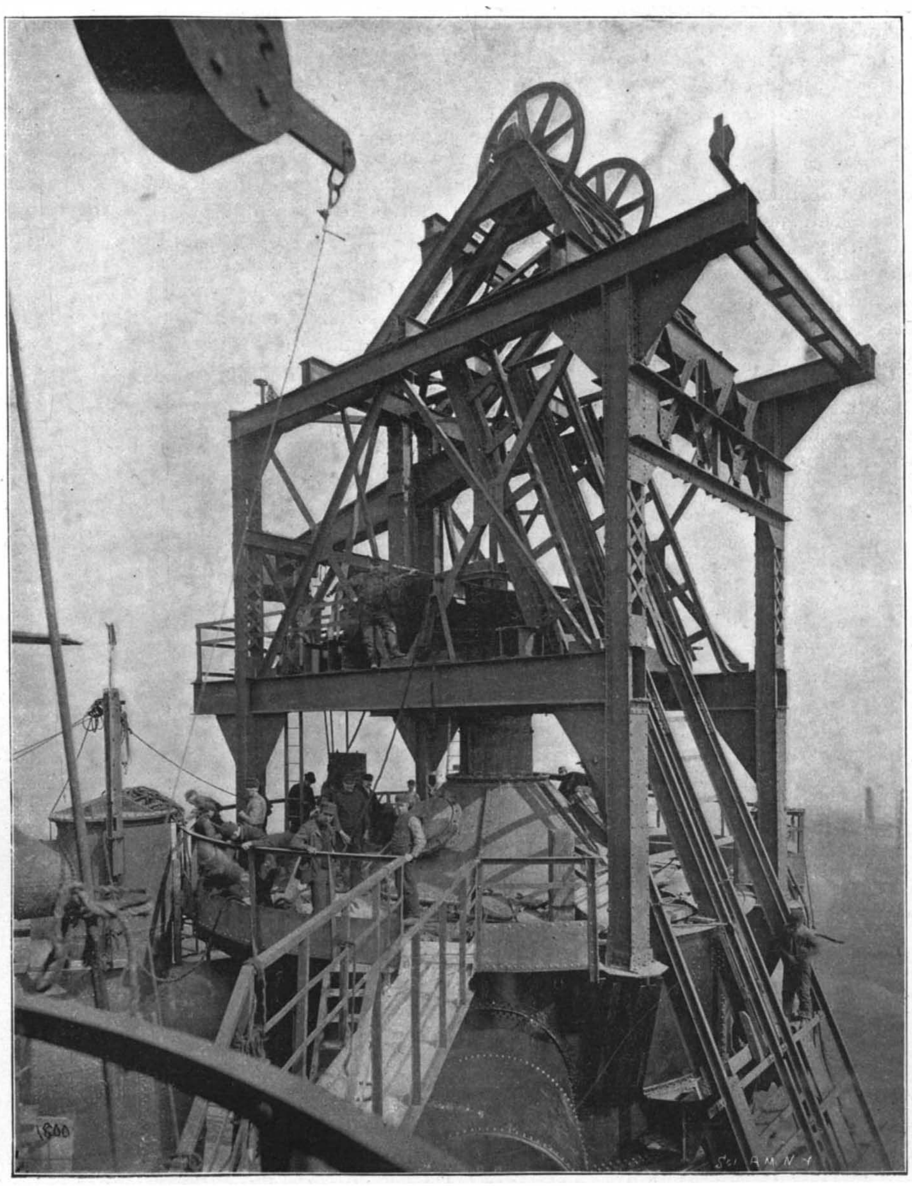
ELECTRICALLY-OPERATED BRIDGE TRAMWAY WITH HOISTING AND CONVEYING APPARATUS.

The bridges travel along their tracks at a speed of fifty feet a minute by means of gearing driven by two 130 horse power electric motors on each bridge. These motors also furnish the power for handling the ore on the bridges, as well as in rehandling it from the stock pile, suitable drums and gearing being connected with the motors. The motors take their current from an overhead trolley above the machinery tower. The operating machinery is located overhead in the main tower, and an operator's house is placed next to the bridge in a position giving the operator an unobstructed view of the ore cars as they move on the bridge, for this apparatus, it should be explained, delivers ore to the stock piles in small cars instead of buckets.

The car-dumping machine, which constitutes an important feature of the installation, is located at a point easily reached from the storage yard in which the regular railroad cars loaded with ore are received. The car-dumper is located on the summit of a slight incline, and in a pit below the loaded car as it reaches the foot of the incline is a disappearing car. This is drawn up out of the pit, moving the loaded car by winding drums located on the car-dumper. A push-bar on the disappearing car engages the drawhead of the ore car, pushing it up grade into the car-dumper.

The car-dumper consists of a substantial steel structure on which is a platform to receive the loaded car. This platform is pivoted at one side, and when the platform with the car load of ore is rotated around this axis, the car is raised sufficiently high to discharge the ore over an apron into four small steel cars of seventeen tons capacity each, mounted on a transfer car alongside the car-dumper. To insure the equal distribution of the ore in the four smaller cars, movable deflectors are pivoted to the apron of the car dumper. These are moved by a steam cylinder with cataract locking cylinder, both being under the control of the operator. By means of this machine gondola, wood or steel hopper bottom cars of twenty to sixty tons capacity can be handled. The car dumper may be operated either by steam engines or electric motors. After the loaded car is run into the car-dumper the operator sets the deflector for either a short hopper car with ore loaded nearly uniform throughout the car or for a long gondola with ore loaded at either end over the trucks, as the case may be.

The 17-ton cars which receive the ore from the car-dumper are of the side-dump pattern. The transfer



TOP OF BLAST FURNACE.

FURNACE HOIST FOR AUTOMATIC CHARGING OF BLAST FURNACES.

car on which they stand side by side is pushed by a locomotive under the front or machinery tower of the bridge in alignment with the tracks on the incline underneath the bridge. These tracks converge into one main track on the bridge, the switches being automatically operated by the car as it passes over them. One by one the cars are drawn up through the incline tracks and down through the bottom chords of the bridge and dumped automatically at any point desired. This is accomplished by a lever underneath the car engaging a knuckle, causing the two hinged side plates to be thrown outward.

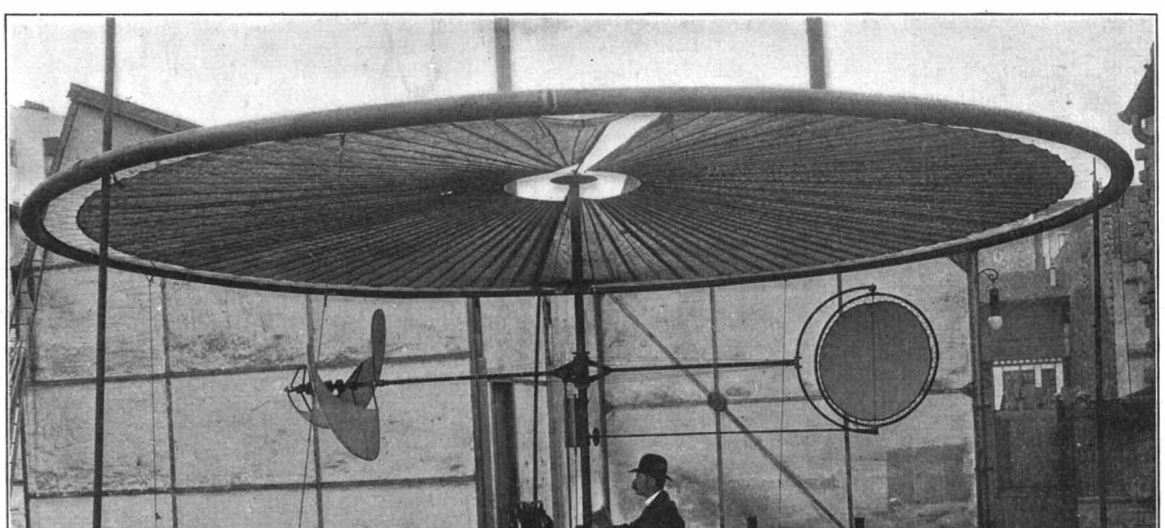
For rehandling the ore from stock pile to bins a second or supplementary track is suspended below the chords of the bridge with a trolley running thereon, which carries an automatic bucket of ten tons capacity that is filled by dragging it up the stock pile. A two-part, clamshell bucket, or a four-part, grapple bucket may be used with equal advantage. When the stock pile from which ore is being drawn is not opposite the bins into which it is desired to put the ore, the 10-ton bucket will empty into the motor cars, which move to the proper bin with their contents. It is possible to bring a train of drop-bottom ore cars directly to the tracks over the bins; but the usual method is by way of the stock yard and conveyor apparatus. The capacity of the car-dumper is thirty railway cars an hour. Each of the bridges is capable of handling fifty of the 17-ton cars per hour, or an equivalent of twelve and one-half railway cars per hour. Three men are required for the operation of the car-dumper, two on each conveyor-bridge and three on the locomotive for moving the transfer cars.

Another important adjunct of the present-day equipment for handling ore at furnaces is found in the furnace hoist for the automatic charging of blast furnaces, which dispenses with the employment of top-fillers, all operations being conducted by one man at the engine at the base of the hoist. The hoist consists, in the main, of an inclined, steel-trussed bridge, starting from a pit in the stock house and reaching to the top of the shell of the furnace, to which it is secured by abutment-lugs and pins. From this point there is an extension of the frame, continuing upward and over the top of the bell and hopper. Secured to the chords of this bridge are cross-ties, supporting a track of T-rails. Running on this track is a skip-car of from one to three tons capacity, the hoist-rope to which it is connected passing over the top sheave and back to the drum of the hoisting engine, near the foot of the incline. When the load has been hoisted to the proper height unwinding is prevented by a special safety throttle-valve.

When the skip-car arrives at the top of the furnace the narrow-tread wheels in front continue on a portion of the track bent in toward the hopper, whereas the broad-tread wheels in the rear pass to outer rails and by continuing thereon, tip the car and dump the load. One of the great advantages of this device is that it obviates the necessity for exposing workmen to the dangers of the noxious gases at the furnace-top. For use in conjunction with the hoist there is a stock-distributor, which absolutely insures any desired predetermined order of distribution of stock in the furnace. The distributor itself consists of a cone-shaped steel structure with an oval spout leading out at one side underneath it, the whole being supported on rollers, which are in turn supported by a built-up structure resting upon the top ring of the furnace. As each trip of the skip is made, this distributing-cone is revolved a certain portion of a revolution by means of gearing connected with the hoisting mechanism and engaging with the ring on the cone. Thus a perfectly uniform distribution is insured.

Other notable devices consist of automatic stock-registers for indicating every time the bell is lowered the exact height of the stock in the furnace and skip-registers for indicating the number of skip-cars charged into the hopper, thus preventing over—or under—filling. All the work of hoisting stock and filling the largest furnaces is easily performed by one man.

DEMOUVEAUX AVIATOR.



VILLARD'S AVIATOR.

THE VILLARD FLYING MACHINE.

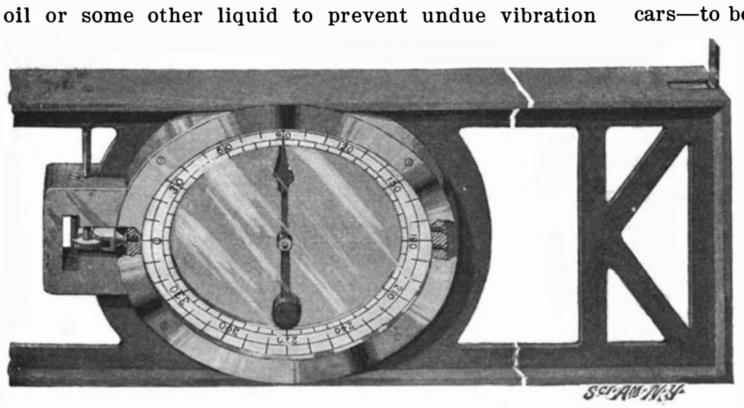
BY OUR PARIS CORRESPONDENT.

A novel form of flying machine has been devised by M. Henri Villard, a prominent engineer and aeronaut of Paris, who has carried on experiments in this direction for some time. His apparatus was exhibited at the last concourse of aviators, but as it was not entirely completed it could not be given a practical trial. The Villard aerostat embodies several different principles in the same apparatus, those of the kite, the parachute and the aeroplane, and part of it is given a gyroscopic motion, such as is exemplified in the well-known toy flier, the rapid revolution of which tends to keep it in the same plane so that is is almost impossible to overturn it. These principles are not contradictory, and may therefore be combined in an apparatus which will possess the advantages of the different forms. The principle of the flying machine may be best explained by imagining a parachute of considerable size and supposing that it is made rigid by an exterior steel rim and wire spokes. Again, if this parachute were attached by a cord, it would act like an ordinary kite. To propel the parachute in the horizontal direction a screw is added, operated by a suitable motor. In this case the apparatus, if started from an elevated point, will fall very slowly and will be enabled to cover a considerable distance from its starting point. One of the most original ideas is to add to the above combination the gyroscopic principle. This is brought about by causing the whole upper part of the parachute to turn rapidly, and as the rim is somewhat heavy this action becomes quite effective, and tends to keep the machine in one plane. In this way the apparatus acquires a great rigidity and it becomes difficult to overturn it. Another point is that the fall of the parachute may be almost or even quite overcome by arranging the upper part so as to give the surface the form of a very flat screw, just enough to compensate for the fall. In this way when the parachute revolves rapidly the descent becomes very slow, and it would no doubt be possible to overcome it entirely if desired. To complete the flying-machine it is only necessary to add a rudder and a seat for the aeronaut. One advantage it will have is that the aeronaut runs but little risk, for should the motor fail to work he will descend as in an ordinary parachute. The inventor has calculated the dimensions as well as the force which should be given to such an apparatus. As the whole machine, with the aeronaut, weighs from 650 to 750 pounds, he finds that according to a bird's proportions he should have about 52 square yards of surface. The form to be given to the screw is that which will overcome the air resistance, which in this case is very small, allowing a speed of 40 feet per second, and not more than ½ horse power would be needed; the inventor allows 4 horse power for the screw. To give a rapid revolution to the parachute requires also but a very small power; this, calculated on the proportions of a flywheel, is found to be about 2 horse power. As the parachute is also built on the plan of a helice, this will absorb, for the lifting, about 4 horse power. For these three different operations he considers that 12 or 14 horse power will be quite sufficient.

M. Villard has already constructed an experimental form of the apparatus, which is shown in the engraving, but expects to modify it considerably before carrying out the practical trials which he is to make next spring. The parachute, which embodies the gyroscope principle, is a large flat wheel, somewhat resembling a bicycle wheel, whose rim is made of a circular steel tube half an inch in diameter and very light. The wheel has an exterior diameter of 22 feet. It is attached to the upper and lower ends of a long hub by two sets of double steel piano-wire spokes, with 100 pairs of wires in each set. The length of the hub is about 3 feet. The parachute covering is stretched upon the top surface; it is made of stout cotton balloon-canvas and offers a resistance of 1,400 pounds per square yard. Below are placed the horizontal shafts of the screw and rudder, at a point calculated according to the resistance which the parachute offers to the air when in movement. The screw, made of canvas stretched upon wire frames, is composed of two similar halves; in front it has a small surface, but increases toward the rear until the whole has a complete half-turn of thread. It is driven by a horizontal shaft which passes to the center and there engages with the vertical shaft of the motor by a worm-gearing. The rudder, mounted in line with the screw, works in a forked support which allows it to turn in the vertical sense. It is directed by a horizontal shaft which engages with it below by a worm gearing. The shaft passes to the center and is there controlled by the aeronaut. To operate the gyroscopic portion and the screw a Buchet motor of the two-cylinder type is used, operated by gasoline which is fed from the reservoir above. The motor gives normally 12 horse power and has 4-inch cylinder-bore and 4-inch stroke; it weighs about 130 pounds and works at 1,920 revolutions per minute. The motor, which is seen on the left, is attached to a circular aluminium box surrounding the main shaft and containing the gearing and transmission devices for operating the whole apparatus. The box is mounted upon a cone-shaped piece whose point rests on the ground. The aeronaut sits upon a small movable seat, mounted upon two horizontal rods, and has at hand the various steering and controlling levers and the hand-wheel of the rudder.

A NEW LEVEL AND PLUMB.

An improved level and plumb has been recently patented by J. V. Janin, of Seattle, Washington. It is designed particularly for determining angles in building operations. The body or frame of the instrument, which is of metal, is made in skeleton form for the sake of lightness. Sights are provided at each end of the instrument, which are hinged, and, when not in use, may swing down into sockets or recesses in the body frame. Supported in a circular central opening of the instrument are two adjustable rings, between which a scale ring is held. The scale ring, on its two opposite surfaces, is marked off to the degrees of a circle. At each side of the scale ring are glass disks, which form the walls of a chamber in which the indicator is adapted to swing. The disks along their inner edges abut against a strip of packing, to which they are held by annular flanges on the adjustable rings. The chamber is thus made liquid tight, and is filled with oil or some other liquid to prevent undue vibration



A NEW LEVEL AND PLUMB.

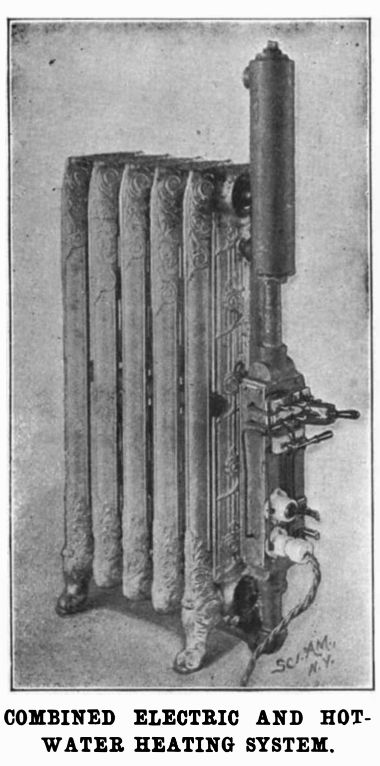
of the indicator. The indicator needle has trunnions near its center, which find bearings in the glass disks. A weight at one end of the needle tends to hold it in vertical position. The other end is forked and straddles the scale ring, forming a pointer for each graduated surface. The instrument can thus be read from either side.

In order to make accurate readings it will be found necessary to adjust the scale ring slightly. The necessary adjustment can be made by turning the thumbnut which is mounted on a threaded stud at the left of the instrument. The sides of this nut are engaged by a yoke piece which is secured to the scale ring. By turning the nut the scale ring can be moved and a proper adjustment made. A set screw is adapted to engage the thumbnut and hold it in place after the adjustment is made.

At the right of the instrument will be noticed two small screws which enter threaded holes in the adjustable rings. Oil can be poured into the chamber through one of these openings, while the air is permitted to escape through the other. The screws normally fill these openings to prevent the escape of the liquid.

ELECTRICAL HOT-WATER HEATING SYSTEM.

A system of heating houses and cars which combines the hot water and electrical systems has been devised by Waldo F. Follett, of New Haven, Conn., who has been recently given patents covering the same. It is claimed to represent high efficiency and to give a uniform and most pleasant heat. The heater itself is made up of but few parts and is yet durable and inexpensive. It is composed of castings which form the connecting heads and circulating flue or water chambers, around which are placed the electric coils of high resistance. The latter are perfectly insulated by lava and specially prepared cement. The heads of the castings are made to receive iron plates, which are held in place by screws and form a casting around the coils. The heat is controlled by a switch made to use in connection with this heater, and with its use the current is reduced without the aid of any external resistance, thereby keeping all the heat within the heating apparatus.



COMBINED ELECTRIC AND HOT-WATER HEATING SYSTEM.

In the application of this system, the electric water heater is placed in the cellar in place of the ordinary coal burner, the rest of the plant being the same as with the ordinary water-heating installation. The controlling switch may be located in any part of the house that may be desired, from which point the temperature of the entire structure may be regulated.

The convenience of such a system will be apparent to any one. There is no handling of fuel or ashes, and there is also the advantage of instant adjustment.

The principle has been applied to the radiator with an expansion tank and pig and circulating pipes, thus forming a portable electric heating system with a flexible cord connection with the electric light bracket. The illustration presented herewith shows a five-section hot-water radiator, wound for a 115-volt circuit. The one pictured has a radiating surface of 34½ square feet. This heating method is said to be particularly well adapted for the purpose of heating street cars—to be used as the steam jacket heater is now used on the passenger cars of the steam railways.

A Device for Saving Fine Gold or Platinum.

An appliance has been perfected in San Francisco for saving the fine flour-like and microscopic values in gold and platinum contained in sands and gravel beds. The process is the invention of Mr. F. M. Johnson, and the patent rights for this and other countries have been purchased by the Rose Gold Reclamation Company, of 720-721 Hayward Building, San Francisco. The appliance is purely mechanical in nature, using neither chemicals, plates nor magnets, and in appearance resembles an ordinary sluice box. Each one has a capacity of about three tons of sand per hour, and the devices are now being operated in batteries of from ten up.

The cost of operating is merely that involved in putting the sand and water into the appliances. Each one requires in the neighborhood of five inches of water. Salt water is as efficient as fresh. As there are thousands of miles of beach sand carrying high values of both gold and platinum, it will be readily appreciated that this is a great advantage.

The first field test was made on the beach at Aptos, Cal., with a continuous run for thirty days, at the rate of three tons of sand per hour. The device saved not only all of the fine gold and platinum, but the coarse gold as well.

At the present time two plants are in actual operation, and others, aggregating over two thousand of these appliances, are in the process of construction.

Passing of Cork Stoppers.

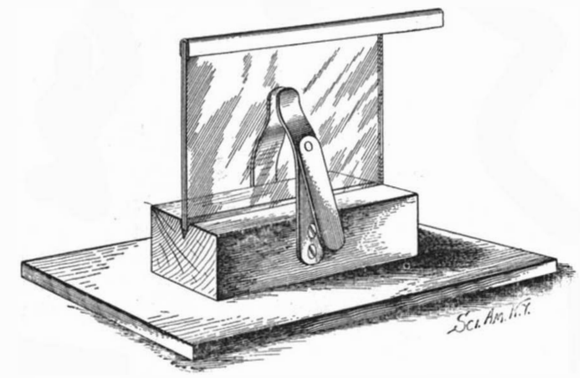
The man who made the discovery many long years ago that a little tapered cylinder of cork was the very best bottle stopper has only been exceeded as a practical genius by those who, within the past century, have set themselves to work to improve upon and undo this early invention, and to get upon the market anything else than a "cork." On both hands there have been successes, the cork people having by improved machinery reduced their price so that there is still to-day nothing cheaper for the closing of a bottle; the patent-stopper men for their part, having shut off avenue after avenue for the use of corks, coming to absolutely control certain lines of trade.

Yet the beginning of the end may almost certainly be seen "as through a glass, darkly." After five centuries of use, says the N. Y. Times, the cork-closing bottles are passing, slowly and with many an effort to hold their own, but passing, nevertheless. Rubber, metal, glass, pasteboard, and pulp are the new coverings of the day that here and there are taking the cork's place. There are financial rewards almost beyond the bounds of the imagination for the inventor who hits the popular taste for a cork substitute, or if not for the inventor, at least for the lucky manufacturer who manages to lease good stopper patent rights.

The new president of the Franklin Institute, Mr. John Birkinbine, has made an earnest appeal for public support, and says that the great work accomplished by the institution was not appreciated. The management has been endeavoring to work up interest in a scheme to obtain accommodations more suited for the work which is carried on. The present building is located in a very crowded section of Philadelphia, where there is no room for expansion, and there is constant danger of fire.

SIMPLE AND INTERESTING INVENTIONS.

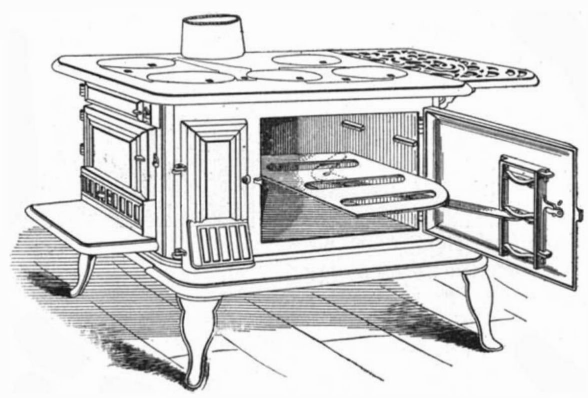
Lantern Slide Clamp.—Anyone who has ever mounted lantern slides knows how difficult it is to bind the glasses together with the customary black tape. In order to facilitate this invention, a clamp has been devised which consists of a base having a wedge-shaped groove to receive the slide and glass plate. The plate and slide are held in the wedge by



LANTERN SLIDE CLAMP.

upwardly-extending springs. The plates being thus held it is a simple matter to bind the edges of the slide and plate.

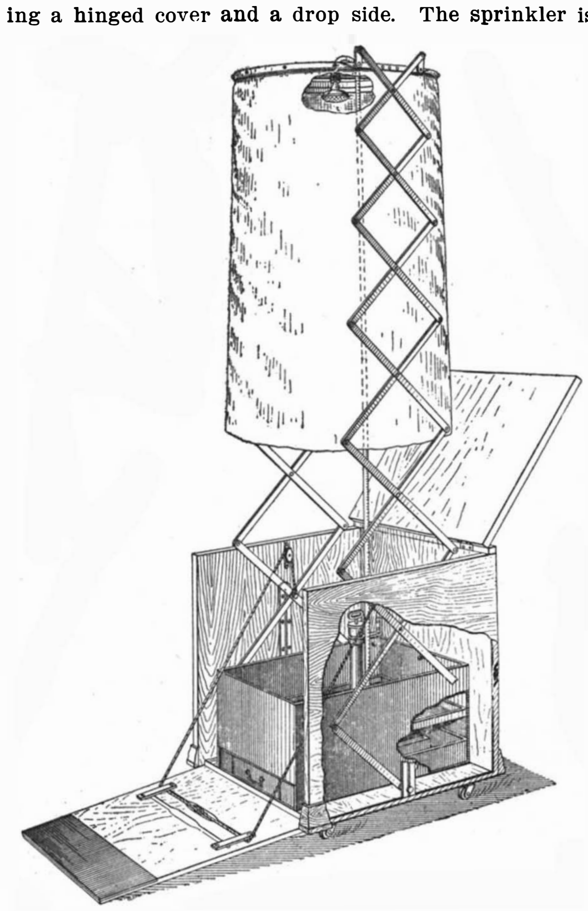
Automatically Operated Oven Shelf.—How an oven shelf can be drawn out of the oven merely by opening the door is shown in a patent issued to a Philadelphia inventor. A bar is pivotally connected with the shelf and has an angle end arranged to come into contact with the inner surface of the oven. A projection upon the bar is automatically engaged by a catch upon



AUTOMATICALLY-OPERATED OVEN SHELF.

the door of the oven. When the oven door is closed, the shelf is pushed in; and when the oven door is opened, the shelf is pushed out. The projection on the bar and the catch are used when it is desired to open the door without removing the shelf.

Folding Shower-Bath Apparatus.—A shower bath that can be folded into a small space is a novelty for which James M. Castle, of Lynn, Mass., has received a patent. The apparatus is contained in a cabinet having a hinged cover and a drop side. The sprinkler is



FOLDING SHOWER-BATH APPARATUS.

carried on either side by lazy-tongs, which are connected by ropes with the drop side. When the side is therefore allowed to drop, the lazy-tongs will simultaneously be extended to elevate the shower-bath apparatus automatically.

Brief Notes Concerning Patents.

Hugh J. Bonner, of New York, who has accepted the tender of an appointment to organize a fire department at Manila, is the inventor of a number of devices used by fire departments. These comprise principally means for opening heavy doors and windows of burning buildings.

The death is announced at Chelsea, Mich., of B. F. Tuttle, who was the inventor of an improvement in the crosscut saw which greatly decreased the labor of using the saw. The attachment was what are known as rakers for removing the chips and sawdust from the logs, making the sawyer's work easier.

Richard T. Barton, formerly of Brooklyn, and an inventor of some note, died at his home in New Haven, Conn., during the early part of January. He devised one of the most successful student lamps which has been made, and he realized considerable money from it. He sold the patent finally to a Meriden company. He was also the inventor of a car vestibule which is in use at present, and a large number of minor things.

Dr. Charles Meyer, of Uerdingen, Germany, has been in this country for some time superintending the construction of a plant at Alma, Mich., for the manufacture of fodder from beet root according to a process of which he is the inventor. This is the first factory of this kind in this country. The Meyer process was awarded a prize of 15,000 marks offered by the beet-sugar growers of Germany.

The recent death is reported of James Spear, president of the James Spear Stove and Heater Company, of Philadelphia. He was the inventor of the first successful railroad car stove, and this at one time was in general use on the roads throughout the entire country. He was also the patentee of an anti-clinker grate which is at present largely used by stove makers. He was 75 years of age, and was interested in a great many charities located in and near Philadelphia.

J. B. Davis, a dentist of New Orleans, recently invented an improvement in the way of forceps for dentist's use which will greatly reduce the cost of the outfit which a dentist is compelled to purchase. His invention consists of the forcep handles, into which can be slipped beaks which are readily detachable. Mr. Davis says that this set is intended more for the use of students and country doctors who pull teeth, and to such persons his device will practically give the advantage of a full dental equipment at a very much reduced cost.

It is announced from Pittsburg that a process of blowing window glass by machinery has been recently perfected there, and a company has been organized to build the machinery and also to make the glass. The National Glass Budget, a paper devoted to the glass interests, has the following to say in this connection: "The introduction of machinery which will materially reduce the cost of cylinder making, and enable manufacturers to cap off and crack open by mechanical and electrical appliances, cannot fail to give the industry a new lease of life, and place it more nearly into competitive position with all kinds of cast sheet and plate glass, because machinery will make thicker and larger sheets than can be made by hand, and eliminate some of the defects inseparable from the hand blowing process." Those interested in the new invention have declined to make any statement concerning the nature of the process.

A commercially practicable process of blowing not only plate glass, but bathtubs and large utensils, has been in use for two years in Dresden, Germany. The inventor is Paul Sievert. The SCIENTIFIC AMERICAN will soon publish a complete illustrated article on the Sievert process.

In a lecture delivered before the students of the College of Commerce and Administration at the University of Chicago recently, Franklin H. Head made a suggestion which he said he thought entirely practical, to light the city of Chicago by utilizing the air movement which almost constantly exists in that section. Mr. Head's scheme is to erect a chain of powerful windmills entirely around the city, and these would be at work all the time charging batteries. He presented a table of wind velocities and windmill efficiencies which seemed to prove conclusively that his point was well taken. This address was made on the 10th of January, and just three days before a patent was granted to Prof. F. Thede, of the same city, covering a scheme to accumulate power in the same manner, except that the latter stores the energy in the shape of compressed air instead of electricity. By means of the windmills coupled together Prof. Thede proposes to compress the air until it is liquefied, and to make use of it in this shape for innumerable purposes. Prof. Thede says that he has the backing to put his idea to the test, and will do so in Chicago because the atmospherical conditions existing there are more favorable than in any other city in the United States. Statistics show that the average wind velocity there is about 16 miles an hour, and this is equaled in no other point in this country.

Legal Notes.

THE GERMAN LAW OF COPYRIGHT ON PHONOGRAPH-RECORDS.—A curious case recently came up for decision in the German Empire, which may be of some value to our readers as a precedent in its way. A well-known opera singer had phonographic records of certain of his songs made for public sale. A manufacturer of phonographs purchased some of these records and reproduced them in large numbers by means of a new duplicating process. The duplicates were sold; and an action was brought against the manufacturer by the opera singer, who claimed that he was entitled to some legal protection. The court granted his claim. The German law of June 11, 1870, relating to the right of an author to his written work, drawings, musical compositions and dramatic works, is intended to prevent the wrongful use of intellectual products, by forbidding their mechanical reproduction. Reasoning by analogy, the plaintiff in the present case claimed that he was entitled to the protection afforded by this statute. But the question arose: Could a song be considered an intellectual product? It is true that the utterances of the human voice, broadly speaking, cannot be protected legally. But in order to be able to sing, there must be not only the natural ability to produce melodious tones, but also persevering study to produce those tones with artistic feeling. In other words, it is not only the sound of the voice itself which an audience desires to hear, but also intelligent interpretation. After the Court had therefore analyzed the human voice, and especially the singing voice, with true German philosophic thoroughness, it came to the conclusion that the song of a trained singer is indeed an intellectual product, and as such is fully entitled to the protection afforded by the act of June 11, 1870. In order to avoid the rendering of an entirely new decision, the Court at first attempted to ascertain whether the record on the wax cylinder could be actually read and distinguished from other records: but since the eye cannot tell one song from another merely by examining wax cylinders, the Court found itself compelled to hold that the unauthorized reproduction of a phonographic record is just as reprehensible as the illegal reproduction of a picture or a book. The case was appealed, but was settled out of court before the appellate bench could hand down an opinion.

In the United States the question could hardly arise. The Librarian of Congress steadfastly refuses to issue copyright papers for phonographic records, because they are not specifically mentioned in the list of intellectual products, the reproduction of which is forbidden by our copyright act. And since, contrary to the German rule, a copyright must first be obtained before an action for infringement can be maintained, it follows that our courts could not well decide after the German manner.

MEASURE OF DAMAGES FOR INFRINGEMENT.—In fixing the damages for infringement of a patent, where it is shown that the patentee had an established license fee for practising the invention, it will be taken as fixing the measure of damages, notwithstanding he may have accepted a smaller sum in settlement with licensees who were in arrears, or made a reduction therefrom, where license fees for a long term were paid in advance.

111 Fed. Rep. (U. S.) 916.

PROCESS FOR REDUCTION OF ALUMINIUM ORES.—The Bradley patents, No. 464,933 and No. 468,148, relating to a process for the reduction of highly refractory and non-conductive metallic ores in an unfused state by electrolysis, some of the claims having specific reference to the application of such process to the separation of aluminium from its ores, are not infringed by the process of the Hall patent No. 400,766, for the reduction of aluminium ores. The Bradley process consists essentially in passing an electrical current through a mass of ore, such current having a sufficient strength and intensity to fuse the ore, and to effect its continuous and progressive decomposition, while the essential feature of the Hall process, which has given it great commercial value, is the employment of a bath of fused cryolite, in which alumina readily dissolves. Such bath has a greater electrolytic stability than the alumina, and the latter, when in solution, is decomposed by passing through the mass an electrical current not having sufficient intensity to effect the decomposition of the bath, which is kept in a fused condition by the heat incidentally developed in the process of electrolysis, and used with repeated charges of alumina. In such process there is not only a different employment of ingredients from that of Bradley, and an entirely new method of operation, but far better results are attained; and, conceding that Bradley was the first to point out the method by which progressive fusion and electrolysis was made practicable, in view of the prior art and of the doubtful utility of his process, which has never been put into commercial use, his patents cannot be given a broad construction, as embodying a pioneer invention, to cover the process of Hall, which has superseded all others and resulted in a remarkable increase in the production and use of aluminium. Electric Smelting and Aluminium Company *vs.* Pittsburg Reduction Company, 111 Fed. Rep. (U. S.) 742.

SOUTH AFRICAN PATENT JURISPRUDENCE.—Under the patent laws of the new British Colonies in South Africa an inventor is compelled to pay heavy taxes to secure several patents in order fully to protect his devices. For that reason the British technical journals are beginning to suggest that arrangements should be made whereby one South African patent should cover all British South African possessions, somewhat after the system adopted by the French government. Under the present arrangement five or six separate patents must be taken out. The South African colonies are vast in extent; but the centers where a patent is likely to be profitable are few and far apart. Patent laws being primarily intended to encourage invention, it follows that the multiplication of expense in securing patents will certainly hamper an inventor in securing adequate protection for a meritorious device.

DESIGN PATENTS.—The United States District Court for the Western District of New Hampshire in a recent decision sums up the essentials of novelty in patents for designs, giving the rule as established by later decisions as follows: (111 Fed. Rep. 1002) "The patent seems to cover two elements: First, the shape or configuration of the monument; and, second, the decorative design for its ornamentation. As to the first, there is nothing in the details or in the combination which can be accepted as new and original. All the features in detail must be treated as old, for the stonecutting art, as known and practised from a very early period, has covered all conceivable shapes and forms in monuments and statuary, and the combination does not, as it seems to me, amount to a new and original design. The second element of the design—that relating to ornamentation—comes nearer to patentable invention than the first. The test is the appearance to the ordinary eye, which results from the design of combining the finished surfaces, the various lines, curves, figures, etc.; and, if this case could be determined in the light of the earlier decisions under the design statute, it would not be difficult to sustain this feature of the patent. But the later tendency has been to require for design patents something akin to inventive genius; or, in other words, as high a design of invention as that required by the rules which govern mechanical patents. In view of the later decisions, I arrive at the conclusion that the decorative design is not so distinctively new and different from previous designs as to bring it within the statute, which requires the design to be new and original."

The United States Circuit Court of Appeals for the second circuit, with reference to design patents has just ruled that (112 Fed. Rep. 61) design patents refer to appearance, and not to mechanical utility, and are intended to apply only to matters of ornament, in which the utility depends on the pleasing effect imparted to the eye, and not to any new function. A calk for a horseshoe is not a proper subject for such a patent.

NEW RESULT FROM OLD PROCESS.—A patent for an electrical insulator and method of making same describes a porcelain insulator for use with high-tension conductors, made, according to the process shown, in two or more separate parts or shells molded so as to nest or fit into each other, and which when dried are coated with glaze, placed together with the open side up, and extra liquid glaze poured into annular channels between the parts. When placed in the oven for firing in this position, the extra glazing material melts, and flows down as the clay shrinks, and fills the spaces and any crevice or crack which may form in the process or firing. It was held, that while neither the making of insulators in parts fitted into each other, nor the uniting of such parts by glazing, was novel, the combination of them with the further step of supplying an extra amount of liquid glaze sufficient not only to fuse the parts into a whole, but to fill all crevices, the result being a superior article, constituted invention, and was not anticipated by anything in the prior art. While the application of an old process to a similar or analogous subject, with no change in the manner of the application, and no result substantially distinct in its nature, will not sustain a patent, even if the new form of result has not before been contemplated, yet, if a new combination and arrangement of known elements produce a new and beneficial result never attained before, it is evidence of invention as a general rule.

111 Fed. Rep. (U. S.) 923.

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

FEEDING-RACK.—Samuel L. Lamoreux, Titonka, Iowa. This improved feeding-rack is so constructed that its several parts may be conveniently adjusted for feeding milk, grain, or hay to calves without danger of spilling the grain or milk.

WEEDER.—William D. Lloyd, Fiskville, Tex. The implement is designed to remove weeds and rubbish simultaneously from each side of a row or drill of corn, cotton, or other plants, and to direct the removed material to the longitudinal center of the row or drill. The implement is provided with hoes, which are given rotary reciprocating motion through gearing and cranks from the supporting-wheels. The hoes are normally held in contact with the ground and can be lowered whenever it is so desired. Independent driving mechanism is provided for each hoe.

CORN-HARVESTER.—Arthur W. Richards, Indianola, Iowa. The invention is embodied in the mechanism employed for severing the ears from opposite sides of each row of stalks whatever be the difference of height of the several ears from the ground. The severed ears are deposited in a suitable receptacle provided on the machine. The different agents which sever the ears from the stalk are spiral reel-cutters extending longitudinally on the front portion of the machine plate, and arranged adjacent to a slot in the frame into and through which the standing corn passes as the machine advances. These reel-cutters differ in size, and one is arranged lower than the other and spaced from it a distance required to admit a row of cornstalks, so that the cutter operates simultaneously on opposite sides. Reciprocating cutters are likewise employed; and these are arranged below and parallel to the rotary reel-cutters, for the purpose of severing the ears that are not clipped by the upper cutters. The ears severed by the various cutters fall upon endless traveling aprons by which they are conveyed to the receptacle provided for them.

Electrical Apparatus.

ELECTRICAL DEVICE FOR THE TREATMENT OF DISEASES.—Dr. William J. Gavigan, Manhattan, New York city. The invention is based upon an entirely new theory of medical electricity. The spinal cord serves as a pathway to conduct motor impulses from the brain and sensory impulses to the brain. What Dr. Gavigan has done is to apply a flexible electrode to the entire length of the spinal cord and a flexible electrode to the body near the part showing symptoms of disease. Thus a current is passed from the spinal cord, through the corresponding nerve to the part showing symptoms of disease. Since all the veterbral spinal processes are covered by a set of electrodes, the seat of disease is necessarily reached.

Engineering Improvements.

PUMP.—Hudson S. Clark, Sigourney, Iowa. The purpose of this invention is to provide a simple, novel construction and arrangement of parts, whereby to prevent the circulation of sand with the water by the operation of the pump in drilled, driven, or other wells. Combined with the pump-tube and its inlet-pipes are a strainer-diaphragm fitting around the pump-tube, and inlet-pipes below the inlet-ends of the latter.

Mechanical Devices.

WIRE-STRETCHER.—Walter Z. Brannon, Brazos, Tex. The device is adapted for attachment to a post or other support and to the wire to be stretched; through the movement of a lever and of two gripping-arms, traveling upon the element to which the wire is attached. This element by one movement of the lever is carried in a direction to place the wire under renewed tension, one gripping-arm acting to bring about such result, the other gripping-arm acting to hold the wire under tension while the actuated arm is advanced for another grip, the locking-arm being free to travel upon the wire-holding element while the actuated arm is in service.

ELEVATOR-GEAR.—William M. Bainbridge, Elkton, Colo. The invention relates principally to the devices for locking an elevator-cage in inactive position. The gear is especially applicable to mining-cages. Dogs are pivotally hung on the cage and are to be operated by a hand-lever. A retractile spring tends to draw the dogs toward each other. By throwing the lever contrary to the action of the spring, the parts will be thrown into operative position; and when the elevator-cage is at the proper elevation the dogs will be seated.

WAVE-MOTOR.—Richard H. Hannah, Ontario, Cal. The invention relates to a means for deriving motive power from the action of waves; and the special feature of the invention resides in certain novel devices for automatically regulating the position of the parts with respect to the varying elevation of the water due to tides and other causes.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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WATER WHEELS. Alcott & Co., Mt. Holly, N. J.

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Stencil Machines.—A. J. Bradley, 101 Beekman St. N.Y.

Inquiry No. 2161.—For makers of toy balloons.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 2162.—For machinery for making wool and cotton blankets.

Rigs that Run. Hydrocarbon system. Write St. Louis Motor Carriage Co., St. Louis, Mo.

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For sheet metal stampings and novelties try Standard Stamping Co., Seventh and Hudson, Buffalo, N. Y.

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Are you looking for anything in bent woodwork? Write Tucker Bicycle Woodwork Co., Urbana, Ohio.

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We develop inventions through their several stages, manufacturing for the market. Amstutz Osborn Co., Cleveland, O.

Inquiry No. 2166.—For makers of oil and gas burners for heating purposes.

Inventions developed and perfected. Designing and machine work. Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 2167.—For manufacturers of cast-iron bells.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 2168.—For a machine for making bricks out of sand by pressure.

WANTED.—Boss millwright for general factory repairs, replacements and alterations. Address Millwright, P. O. Box No. 653, New York City.

Inquiry No. 2169.—For makers of sheet metal dies for cutting and forming parts of padlock.

Designers and builders of automatic and special machines of all kinds. Inventions perfected. The W. A. Wilson Machine Company, Rochester, N. Y.

Inquiry No. 2170.—For parties to undertake the manufacture of a special metal clamp.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 2171.—For some method of transferring designs in bronze from paper to cloth.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 2172.—For makers of gears of all kinds.

WANTED. — A cheap engine-lathe that will swing from twenty-four to thirty inches over bed. Bed anywhere from ten to fifteen feet. J. W. Murkland, Barton, Vt.

Inquiry No. 2173.—For the address of the makers of the Interchangeable Safety Step.

WANTED.—Foundry chemist who can also superintend cupolas and produce iron at lowest cost. Young man preferred. Stover Manufacturing Company, Freeport, Md.

Inquiry No. 2174.—For parties dealing in electro nickel and silver plating supplies.

Wanted—Revolutionary Documents, Autograph Letters, Journals, Prints, Washington Portraits, Early American Illustrated Magazines. Correspondence Solicited. Address C. A. M. Box 773, New York.

Inquiry No. 2175.—For machinery for making glassware.

WANTED.—A horizontal 10 to 20 h. p. second-hand gasolene engine in A 1 condition to run dynamo, Fairbanks make preferred. Address, with price and particulars, Paul Hunt, Belvidere Court, Boston, Mass.

Inquiry No. 2176.—For makers of machinery for a tanning extract plant.

Those using now Duplicators or desiring to reproduce many copies of writing—all alike—do well to state their needs to the original inventors of the latest multicopiers. S. C. Bensinger, Manager, 265 Broadway, N. Y.

Inquiry No. 2177.—For machinery for making oil from castor beans, palm nuts, etc.

EXPERIMENTAL MACHINE SHOP.—We are not using our shops at present. Well equipped with lathes shaper, woodworking machinery, etc. Will rent use and power very low. Fine place for automobile work. Billings Clapp Co., Boston, Mass.

Inquiry No. 2178.—For dealers in hydraulic rams.

MANUFACTURER WANTED.—For patent shaft-governed high-speed engine, fully demonstrated, authentic tests. All machine works standarized for cheap production. Full working drawings and personal supervision if required. Address Y. K. E., at Horncastle's Advertising Offices, 61 Cheapside, London, England.

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Inquiry No. 2180.—For makers of a combination kitchen range and water heating apparatus.

Inquiry No. 2181.—For manufacturers of kitchen cabinets.

Inquiry No. 2182.—For machinery for the manufacture of excelsior.

Inquiry No. 2183.—For a combination steam lawn mower and roller.

Inquiry No. 2184.—For manufacturers of "Spirit Lamp" for heating model engines of special dimensions.

Inquiry No. 2185.—For manufacturers of steam turbines.

Inquiry No. 2186.—For a small engine about ½ horse power.

Inquiry No. 2187.—For dealers in electric ceiling fans.

Inquiry No. 2188.—For manufacturers of cardboard houses.

Inquiry No. 2189.—For brass or other metal tubing not larger than a common round lead pencil, not to bend easily.

Inquiry No. 2190.—For makers of wood, bone or rubber handles for printing advertising thereon.

Inquiry No. 2191.—For machines for making tin boxes.

Inquiry No. 2192.—For makers of modern hay presses.

Inquiry No. 2193.—For machinery for sorting, cleaning and cutting sardines.

Inquiry No. 2194.—For rag paper manufacturers to make special paper.

Inquiry No. 2195.—For small engines with 1 to 2 horse power boiler.

Inquiry No. 2196.—For an apparatus for burning lead.

Inquiry No. 2197.—For dealers in talcum powder.

Inquiry No. 2198.—For makers of hydrofluoric acid.

Inquiry No. 2199.—For an electrical flashing cabinet for advertising purposes.

Inquiry No. 2200.—For manufacturers of roller bearings.

Inquiry No. 2201.—For paper-making machinery.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

February 25, 1902,

AND EACH BEARING THAT DATE.

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

Acidyl dialkylrhodamin and making same, C. Hoffman 694,149
Adding machine duplicate printing mechanism, D. E. Felt 693,958
Aerator, milk, L. E. Morgal 694,296
Agricultural implement, E. G. Bowman 694,088
Agricultural machine steering device, C. F. Grohmann 694,010
Agricultural machinery, J. Clark 693,999
Air brake, C. A. Seley 694,328
Air brake operating mechanism, compressed, J. Lipkowski 693,874
Air compressing apparatus, Howe & Vauclain 694,280
Air compressor and cooler, O. P. Ostergren 694,299
Air, generation of power from compressed, F. M. Leavitt 693,871
Air, propulsion of torpedoes, etc., by compressed, F. M. Leavitt 693,872
Alarm. See Thermo electric alarm.
Alimentary extracts, preparing, E. C. L. Kressel 694,102
Alloy, Wolfe & Englert 694,224
Amalgamating machine, G. C. Scott, 694,112, 694,203, 694,204
Amalgamator, J. R. Sawyer 694,201
Amalgamator, fine gold, M. Lasswell 694,290
Animal tie, J. T. Horris 694,279
Annealing furnace, E. Danner 694,054
Arc lighting system for alternating currents, L. & A. Privat 694,190
Arch construction, rib for concrete, K. S. Riser 694,193
Automatic sprinkler, W. H. Stratton 693,924
Automobile controller mechanism, J. G. MacPherson 694,065
Baling machine, O. S. Lee 694,166
Baling press, W. S. McLemore 693,983
Ball shaped or spherical bodies, machine for forming, S. Smith 694,330
Barrel closure, P. Mink 694,171
Barrel machine, A. C. Luyckx 694,167
Basket, T. J. Langston 694,289
Basket making machine, O. Schleicher 693,911
Battery systems of distribution, automatic regulator for storage, C. H. Holderrieth. 693,863
Battery zinc element, primary, H. J. Brewer 694,089
Bearing, shaft, G. Wideman 694,043
Bearing slide, ball, C. C. Protheroe 694,028
Bed, W. D. Olney 694,183
Bedstead, couch, D. C. Storr 693,923
Belt and pulley gearing, L. J. C. Souhami. 694,211
Belt folding machine, B. O. Hale 694,099
Belt gearing, W. Newman 694,175
Belt shifter, F. Hirsch 693,969
Berth, etc., for ships, self leveling and adjustable, C. St. Hilaire 694,214
Beton strengthened by metal, system of construction with, H. Henkel 693,966
Billet heating furnace, C. H. Morgan 694,022
Bit, R. A. Shafer 693,914
Boat or vessel, submarine, J. P. Holland .. 694,154
Boats, means for automatically ballasting submarine, J. P. Holland 694,153
Book, manifold, A. Levison 694,103
Bottle capping machine, R. Flanigan 694,144
Bottle stopper, J. A. Hayes 694,013
Bottle stopper, J. & J. A. Butkus 694,131
Bottle stopper, non-refillable, J. W. Calef .. 693,834
Bottle stoppering machine, J. & J. A. Butkus 694,132
Box. See Mail box, match box.
Box stapling machine, J. Schmidt, Jr 694,031
Brake mechanism, F. M. Smith 694,207
Breech closure, H. J. Perry 693,900
Brewer's vat, W. Griesser 694,267
Brick edger, W. Towers 694,120
Brick for building arches, E. Bottger 693,826
Brick kiln, J. Cicotte 694,316
Brick making press, J. E. Grinder 694,009
Buckle, trace, S. Boyer 693,827
Buffing machine, J. M. Sellmayer 693,912
Buggy top support, Boxley & Holmes 694,243
Buildings having circular or regular shaped roofs converging in one point, construction for, M. H. Vail 693,989
Button or catch for coat collars, J. A. Linderman 694,104
Caddy, base delivery, G. Bernhard 694,237
Calender roll cleanser, J. Frossard 693,853
Camera, photographic, F. H. Sanderson 694,080
Camera, swing back photographic, V. Odquist 694,181
Can filling machine, H. R. Stickney 693,921
Can straightener, C. W. Nicklaus 694,177
Candle making machine, W. H. Day 694,093
Canopy, G. A. Babbitt 694,232
Car brake stand, J. W. Puckett 694,191
Car coupling, P. Brown 693,998
Car door, grain, J. Montgomery 693,979
Car door, hopper, R. V. Sage 693,910
Car, dumping, H. S. Hart 693,858
Car fender, street, A. Fischer 693,960
Car, freight, F. P. Butts 694,052
Car haul, A. M. Acklin 694,047
Car safety attachment, C. A. Willard 693,935
Carbureter, explosive engine, L. H. M. Sanson 694,110
Carriage clutch adjustment, motor, D. F. Graham 693,963
Carriage steering gear, motor, Fox & Graham 693,962
Carrier. See Music carrier.
Carrier track, G. Wideman 693,934
Cartridge, H. Maxim 694,295
Cash register, C. C. Stearns 694,035
Cash register, N. Collins 694,252
Cask support, W. Griesser 694,266
Caster socket, W. Livingstone 693,875
Casting mold, J. J. Carroll 694,315
Ceilings and walls, construction of, A. Rincklake 693,905
Cement and making same, adhesive, R. H. Willis 694,045
Chaffer or sieve, adjustable, F. Hixson 694,148
Charging buggy, O. Sundt 694,332
Chimney cap, A. T. Cox 693,951
Chopper. See Cotton chopper.
Chuck operating device, Potter & Johnston. 694,189
Churn, S. P. A. Andersson 694,126
Cigar, J. D. Tynen 694,217
Cigar lighter, electric, J. M. Althouse 694,311
Cigar pressing apparatus, R. Woerner 694,082
Cigar wrapper cutter, C. & L. J. Du Brul .. 694,259
Cleaner. See Comb cleaner.
Clock, geographical, C. E. Davis 693,953
Clock, geographical, A. J. Day 694,256
Cloth board, registering, J. W. Currier 694,001
Clutch, friction, F. G. Hampson 694,270
Clutch mechanism, C. M. Day 693,954, 693,955
Coffee roaster, E. Linaberry 693,873
Coin operated machine, C. L. Hurd 694,282
Collar blanks, etc., folding machine for, R. D. Viele et al 693,931
Collar, pneumatic horse, C. S. Boehm 694,339
Collar stuffing, horse, B. H. Rueter 694,198
Collisions at sea, apparatus for preventing, N. Gherassimoff 693,855
Comb cleaner, A. & C. Syverson 694,040
Concrete body molding machine, M. A. Winget 694,123
Concrete preparing and laying machine, J. T. Dempsey 693,844
Conveyer bucket, L. A. Brigel, Jr 694,245
Conveyer system, E. W. McKenna 694,067
Cord or rope machine, T. W. Norman 693,887
Corn, apparatus for separating silk from green, E. Houston 694,017
Corset, D. Kops 694,160, 694,161
Cotton chopper and cultivator, W. C. Elsey. 694,055
Couch roll, H. Parker 693,894
Cut off, variable, A. D. & J. H. Gillett 694,057
Cutter head extension, C. E. Hawley 694,060
Cycle stand, C. W. L. Schmidt 694,030
Dark room, portable, A. Werner 694,221
Dental device holder, J. A. Mead 694,021
Derrick and hoisting mechanism, hoisting, A. Zastrow 693,940
Developing trays, device for supporting rolls in, E. P. Smith 694,116
Diamonds, cutting, J. H. G. Stuurman 694,215
Display rack, W. A. H. Winter 694,124
Door hanger, G. Wideman 694,044
Door, warehouse, W. A. Cross 693,952
Draft equalizer, J. J. Cox 693,840
Draft equalizer, A. Cogswell 694,000
Drain hopper, slop, H. H. Kendrick 693,972
Drain repairing apparatus, G. Rose 694,196
Drier. See Lead drier.
Drinking cup and shaving mug, combined traveler's, F. Finley 693,959
Dump shovel, hand, J. Felton 694,263
Ear protector, E. E. Kistler 694,159
Electric current induction machine, alternating, E. Danielson 694,092
Electric current induction motors, device for starting alternating, K. A. Lindstrom .. 694,105
Electric machine or motor, dynamo, W. R. V. Marshall 694,293
Electric motor, Pocock & Kennedy 694,075
Electric switch, T. H. Brady 693,995
Electric transformer current regulator, F. R. M. Cutcheon 693,841
Electric wire conduit, E. D. & H. N. Speer. 693,916
Electrodeposition, forming bodies by, C. Steinweg 693,918
Elevator hoisting motors, controlling mechanism for, H. Rowntree 693,908
Elevator safety device, H. Rowntree 693,907
Elevator safety device, W. H. Wilsey 693,936
Elevators, automatic control system for, B. N. Jones 694,158
Engines, electric igniter for gas, F. Burger. 694,250
Engines, igniting apparatus for internal combustion, G. B. & E. W. Petter 694,186
Excavating machine, J. D. Blalock 694,240
Excavating mechanism, C. W. Bradshaw ... 694,244
Explosive engine, W. Hibbard et al 694,016
Fabric cutting machine feeding device, C. Stone 693,922
Fare register, J. F. Ohmer et al 694,322
Faucet, A. Huck 693,865
Faucet or cock, A. Clarkson 693,839
Feed trough and rack, combined, A. B. Swope 693,925
Fence, farm, B. F. Zent 694,084
Fence post, E. M. Bunce 693,947
Filaments for incandescent electric lamps, former for, G. C. Webster 694,220
File, paper, S. F. Beckwith 694,235
Firearm, automatic, T. C. Johnson 694,157
Firearm, breech loading, F. Snyder 694,331
Fire escape, J. Frenzel 694,145
Fire escape tower, portable, P. MacRae ... 693,877
Fire kindler, C. Pollard 694,027
Fireplace heater, T. B. Jackson 694,155
Floor cloth, machinery for use in the manufacture of mosaic or inlaid, E. Batten. 694,233
Floor treating machine, Raasch & Krueger. 694,077
Fluid pressure brake, automatic, W. H. Clarke 693,949
Flying machine wing, W. J. Bell 693,943
Folding case or crate, A. McDonald 693,981
Folding chair, La Coursiere & Steffen 694,163
Forge chimney, blacksmith's, W. E. Canedy. 693,838
Furnace, S. T. Bleyer 694,241
Furnace fuel feeding mechanism, Burger & Williams 693,829
Furnace grate, boiler, R. Mitchell 693,880
Fuse, blasting, Harris & Bray 694,271
Gage. See sliding gage.
Gaiter, W. Lanz 694,164
Garment supporter, S. S. Conant 694,253
Gas burner, H. S. Campbell 693,836
Gas burner, P. Kries 694,287
Gas, gasolene, or inflammable vapor engine, A. W. Clayden 694,090
Gas generator, R. A. Kummer 694,288
Gases, apparatus for saturating liquids with, Weis & Anderson 694,081
Gate, Patrick & Sprague 693,898
Gear, transforming, H. Rose 694,197
Gold bearing material, concentrator for, G. G. Sale 694,199
Gold separator, A. L. Dana 694,255
Grain drill feed mechanism, F. J. Noechel. 694,069
Grate, F. Burger 693,828
Grinding machine safety stop motion, M. P. Fillingham 694,096
Gun, air, W. R. Benjamin 693,823
Gun, repeating, B. R. Harrington 693,965
Hammer, pneumatic, M. A. Yeakley 693,939
Hammock pillow attachment, I. E. Palmer .. 694,070
Hammock spreader, I. E. Palmer 694,071
Hand rake, D. B. Simpson 693,986
Harrow, J. B. Morrison 693,882
Harrow, C. S. Sharp 694,113
Harrow, disk, Packham & Oates 693,891
Harrow disk journal, O. E. Johnston 693,867
Harrow, riding, J. Francoeur 693,851
Harvesting onion sets, etc., machine for, J. W. Jefferson 694,284
Hat for firemen, etc., J. L. Maitland 694,168
Hay rake, horse, A. F. Brown 694,051
Heating and cooking shelf, portable, A. W. Newell 694,174
Heating boiler, steam or water, Kuen & Hodges 693,870
Heating device, electric, E. Kastner 694,018
Heating material, H. Campbell 693,835
Heating system, hot water, I. D. Smead 694,206
Heel breast concaving machine, J. G. Buzzell 693,833
Hinge device, R. J. Irving 693,971
Hinge, spring, A. S. Held 694,273
Hoist, D. H. Morgan 693,881
Hoisting apparatus, M. W. Cox 694,091
Horse boot, C. B. Tuttle 694,340
Horseshoe machine, O. W. Siebenhaar 694,205
Horseshoe, soft tread, Alexander & White ... 693,942
Hotel register, W. C. Loney 694,291
Hub, T. G. Mandt 694,292
Hydrant, D. F. O'Brien 694,180, 694,298
Hydant cap, J. P. Mern 694,170
Hydrocarbon apparatus, D. F. O'Brien 694,179
Hydrocarbon in portable reservoirs, means for producing pressure on the, J. G. Branch 694,305

(Continued on page 177)

Ice into cubes or blocks, machine for sawing, J. S. Duncan 694,260
Journal box, P. Brown 693,997
Kinematograph, L. E. Granichstaedten 693,856
Knitting machine, W. G. Stewart 694,036
Knitting machine attachment, R. Rohleder. 694,195
Labels, machine for applying paste to, Butterfield & Schmitt 693,832
Ladder and shelf combined, step, C. E. Page. 693,892
Lamp, incandescent, E. McOuat 694,068
Land roller, J. C. Stark 694,213
Lathe, multiple spindle, F. Hirsch 694,277
Lathe tool, Koeller & Dyer 693,974
Laundry bracket or clamp, J. T. Watkins .. 694,302
Lead, apparatus for manufacturing white, F. J. Corbett 694,139
Lead drier, white, T. E. Kearns 693,869
Lead, manufacturing white, F. J. Corbett .. 694,138
Leg, artificial, J. A. Peer 694,325
Life saving suit, H. M. Brand 693,996
Linotype, D. F. Daley 694,141
Liquids, apparatus for storing, measuring and delivering aerated, Pirie & Sharman 694,187
Loading or unloading apparatus, J. T. Dempsey 693,845
Loom, Nierhaus & Kaiser 694,108
Loom bobbin holder, circular, C. N. Brown. 694,128
Loom warp stop motion, H. Wyman 694,083
Lumber or structure, compound, G. L. Smith. 693,915
Mail bag gripping and delivering device, S. R. Patten 693,899
Mail box, A. Stansel 693,917
Mail box, M. M. Conklin 694,053
Mail box, rural delivery, W. L. Vestal 694,219
Mail marking machine, J. Geary 694,007
Match box, J. T. Matthews 694,169
Match safe, J. R. Webb 693,933
Matrix plate, stipple, B. Smith 694,115
Measuring and recording oscillating movements of bodies, apparatus for, M. Arndt 693,990
Mercerizing apparatus, A. Romer 694,109
Milk, producing dry condensed, W. A. Hall. 694,100
Milker, cow, A. A. & H. A. Ewald 693,850
Mill. See Rolling Mill. Windmill.
Miner's squib, F. H. & E. Gross 693,964
Mining elevator, H. W. Davis 694,002
Miter machine, W. J. Parsons 694,323
Mitten, W. L. Pollard 694,188
Motor gearing, W. E. Canedy 693,837
Motor or engine, A. E. Olney 694,182
Muscle tester, coin controlled, C. C. Yancey 694,226
Music carrier, sheet, R. L. Mattoch 693,878
Neckwear fastener and shield, W. H. Hart, Jr. 694,272
Needle, tape, C. L. Hughes 694,281
Niter oven, A. P. O'Brien 694,024
Nut lock, J. O. Wolford 694,125
Nut lock, J. W. Norman 694,178
Nut lock, E. F. Briggs 694,246
Oil burner, crude, G. E. Witt 693,938
Oil hole cover or cup, C. F. Tucker 693,927
Oil, paint, H. Zingg 694,085
Ordnance primer, C. von Gortz 694,265
Ore concentrator, W. G. Dodd 694,005
Ores, reducing carbonaceous, R. McKnight .. 693,982
Package, Bird & Hanscom 694,304
Packing box, M. Herz 694,275
Packing rings, automatic machine for making, E. G. Newell 693,886
Paper feeding machine, C. A. Sturtevant ... 694,039
Paper machine sizing apparatus, A. E. Fullner 694,146
Paper making machine, H. Parker ... 693,895, 693,897
Paper, manufacture of wool, H. Zilles 693,941
Pawl and ratchet brake, Canaple & Thiebaux 694,251
Pea hulling machine, green, A. Thomas 693,926
Pencil clip and calendar, combined, T. Griffin 694,098
Percolator, J. C. Seney 693,913
Photographic plates, bronzing, C. P. H. Ahrle 694,227
Photographic screen or canopy, H. C. Moore. 694,172
Piano, F. V. Neuville 693,885
Piano action, upright, P. D. Strauch 694,118
Pin sticking machine, safety, W. D. Middlebrook 693,978
Pipe clean out, drain or soil, J. Crawford .. 694,140
Pipe coupling, J. Burke 693,830
Pipe coupling, W. M. Pearce 694,072
Pipe joint, pivot, T. W. Moran 694,321
Piston and piston rod, A. F. Ritchie 694,078
Planing machine, C. W. H. Blood 694,314
Planters, cotton planting attachment for corn, Joyner & Springer 694,285
Plaster board, J. Schratweiser 694,111
Plow, J. A. Ross 694,079
Plow, J. W. Woodward 694,225
Plow, O. W. & M. L. Budd 694,249
Plug attachment, C. F. Howes 693,864
Pneumatic despatch tube receiver, A. W. Pearsall 694,324
Preserving apparatus, food, M. D. Ellis 694,261
Preserving fruits, etc., A. L. de Sturler 694,301
Press. See Baling press, Brick making press.
Printer's quoin, F. J. Beck 694,313
Projectile, J. B. Semple 694,032
Propeller, bouyant, B. T. Herold 694,274
Pulley, H. H. Boyce 693,945
Pulley covering, R. H. Willis 694,046
Pulp and paper making machine, H. Parker 693,896
Pump for handling heavy oils, F. O. Sterrett 693,920
Pump, mixing, H. F. C. Soellner 694,210
Pump-rod ejector, W. Hoekstra 694,278
Push-button for locks, etc., Laughlin & Schuyler 694,341
Puzzle device, W. E. Stubbs 694,038
Rail-joint, B. F. Stephens 693,919
Rail-joint, O. S. Weddell 694,122
Rail-joint, J. L. Campbell 694,134
Rail-joint and fish-plate, boltless, J. M. Bebout 694,086
Railway construction, W. M. Hickok 694,276
Railway gates, electrical operating apparatus for, H. C. Lavery 693,975
Railway signal, B. W. McDowell 693,883
Railway switch, D. J. Griffith et al 694,058
Railway switch, street, W. J. Bell 693,944
Railway tie, C. De Cew 694,257
Railway track structure, C. H. Krauss 694,162
Railway track structure, H. B. Nichols 694,176
Railway, tramway, etc., J. Brown 694,129
Railways, automatic audible signaling on, J. Goode 694,008
Razor hones, automatic oscillating skid or support for, T. Anderson 694,229
Razor, safety, J. H. Becker 693,992
Reciprocating engine, C. C. Protheroe 694,076
Releasing trap, G. N. Portman 693,901
Reversing mechanism, C. E. Rains 693,904
Rice hulling and polishing machine, Van Houten & Prevatt 693,930
Rod coiling apparatus, De Lamarter & Wallace 694,003
Roller. See Land Roller.
Rolling mill, Z. W. Onions 694,025
Rolling pin, potato masher, and biscuit cutter, combined, H. L. Meyer 694,066
Rope grip, H. M. Sackett 694,029
Rotary engine, E. R. Hyde 694,101
Rotary engine, T. J. Masters 694,294
Rotary fluid engine, J. F. Cooley 693,950
Rotary furnace, C. Groll 694,268
Rotary motor, B. V. Szabo 694,333
Roundabout, C. W. Hinchcliffe 693,968
Rubber belts, apparatus for stretching and vulcanizing a plurality of, Bowen & Ericsson 694,087
Rule, slide, J. H. C. Dennert 694,258
Ruler, flexible, F. G. Hunt 694,061
Ruler, parallel, J. Page 694,185
Sad iron, A. Luethi 693,876
Safe door, A. Gustafson 693,857
Saftey pin, M. Berube 694,238
Sash fastener, W. W. Battles 694,234
Saw filing machine, H. F. Noyes 693,985
Saw guide, C. R. Van Horn 694,337, 694,338
Saw set, M. N. Du Bois 694,142
Saw setting machine, J. Honf 693,970
Scaffold bracket, W. E. Arnold 694,230
Scale, computing, M. A. Dees 693,843
Scale, platform, A. Doering 693,847
Scale, price, M. A. Dees 693,842
Screen. See Photographic Screen.
Screw press, hand and power, E. A. Muller 693,980
Screw, take down, T. C. Johnson 694,156
Seat, L. Janson 694,283
Seat spider, H. W. Bolens 693,824, 693,825
Sewing machine, buttonhole, J. T. Hogan, 694,150, 694,151

Sewing machine feeding mechanism, W. C. Free 693,852
Shade roller bracket, F. Auer 694,049
Sharpening device, grinding plate, Foos & Copenhaver 694,056
Shingle dipping tank, I. Harvey 694,059
Shirt, S. Butz 694,133
Shirt folding machine, M. Peukert 694,074
Shoe, marsh, W. D. Kelsey 694,019
Shoe polishing apparatus, N. C. Spring 693,987
Shoe tree, G. F. Dunn 693,848
Show card pin fastener, L. Lemos 694,063
Shuffle board, H. Vaughan 694,121
Siding gage, L. P. A. Nelson 694,023
Signal recording mechanism, Schoeffel & Aylward 694,327
Smoke preventer, automatic, R. W. Cavenaugh 693,948
Smoke preventing and fuel saving device for boilers or other furnaces, G. Gregory 694,147
Sole chamfering and feather edging machine, G. L. Preble 693,902
Spark arrester, Allen & Browne 694,228
Spraying machine, Metcalf & Hall 694,106
Stamp, hand, A. L. Edgarton 694,318
Stamping or embossing machine die carrier, A. G. Brewer 694,127
Stave column, J. S. Miller 694,320
Stave jointing machine, H. U. Palmer 693,893
Steam boiler, multitubular, F. D. Althause .. 694,048
Steam generator, H. Bedet 694,236
Steam trap, R. J. Flinn 693,961
Stereotype plate cutting machine, Nisbett & Andrews 693,297
Stiffener for ladies' clothing, P. G. Wahlen 693,932
Stones, tiles, etc., manufacture of artificial, E. Rott 693,906
Stove, H. H. Holden 693,862
Stove, vapor, J. P. Newbold 694,173
Stretcher, collapsible, K. Frenle 694,097
Striking machine, coin controlled, Thenan & Nourse 694,235
Suspender and garment clamp, L. Lemos 694,064
Suspenders, R. P. Robinson 694,194
Suspenders, L. A. Talbert 694,334
Switch operating mechanism, J. Eisele 694,006
Tanning process, rapid, K. F. F. G. Sommer 694,034
Tap, ale cask, J. Kenney 694,286
Tape holder, R. J. Smeeton 694,329
Target, indestructible bird, E. E. Thresher. 694,216
Telephone exchange switchboard system, W. S. Paca 693,889
Telephone exchange system, W. S. Paca .. 693,890
Telephone transmitter sanitary shield, J. B. Tauveron 694,041
Thermo electric alarm, H. Black 694,239
Thill coupling, C. C. Bradley 694,050
Thread holder for spools, D. Gamble 693,854
Threshing machine band cutting and feeding device, W. D. Lindsay 693,976
Time recorder, W. P. Gurr 694,012
Tire clamping device, vehicle wheel, J. D. Prescott 694,326
Tire, elastic, W. F. Williams 694,223
Tire setting machines, device for bringing together the ends of solid rubber tires in, J. A. Burrows 693,831
Tire valve, pneumatic, Barrett & Phillips .. 693,991
Tires to wheels, apparatus for securing rubber, G. Meyer 693,879
Toaster, bread, R. C. Vroom 694,042
Tobacco pipe, P. M. Olson 693,888
Tobacco stemming machine, A. J. Bush 694,130
Toilet rooms, device for cleaning and disinfecting the seats in, J. & E. von Stryk. 694,119
Tool, O. J. Jolley 693,868
Tooth crown and making same, artificial, E. Nagy 693,884
Top, spinning, G. Ulett 693,928
Trace carrier, T. D. Thurmond 694,336
Track cleaning device, F. Hedley 693,859
Traction road, electric, L. Dion 694,317
Traction wheel, B. Beskow 694,303
Tree protector, expansible, J. H. Smith 694,208
Tree support, T. P. Brown 694,247
Trolley, J. S. Van Leer 694,218
Trolley, electric car, E. W. Taylor 693,988
Trolley pole support, F. H. Lippincott 694,020
Trolley stand, H. Holland 694,152
Trousers leg protecting attachment, B. F. Salmon 694,200
Truck bolster, R. V. Sage 693,909
Truck, car, S. W. McMunn 693,984
Truck, car, W. T. Shryock 694,114
Truck, casket, D. B. Hiser 693,860
Truck, stove, W. T. Buck 694,248
Trunk, transformable, F. E. Knight 693,973
Turbine engine, H. H. Boyce 693,946
Twine holder, G. E. Ernst 693,849
Twyer, G. Doan 694,004
Type bar, composite, L. A. Brott 694,308
Type bars, production of, L. A. Brott 694,309
Type cleaning device, J. T. Cawthorn 694,136
Type line composing and casting device, Z. Halacinski 694,269
Type magazine, L. A. Brott 694,310
Type writing machine, C. E. Peterson 694,073
Type writing machine, B. C. Stickney 694,117
Types and type bars, machine for the production of, L. A. Brott 694,306, 694,307
Valve device or fitting, J. A. Serrell 694,033
Valve, flushing, F. W. Meyer 694,107
Valve grinding mechanism, A. Henning 693,967
Vat. See Brewer's vat.
Vehicle, J. M. Smith 694,209
Vehicle brake, Packard & Hatcher 694,184
Vehicle gear, W. L. Marshall 693,977
Vehicle propulsion mechanism, F. Duquemin 693,956
Vehicle running and steering gear, motor, W. Bowker, Sr. 693,994
Vehicle, shifting seat, C. H. Stratton 694,037
Vehicle wheel, C. B. Van Horn 693,929
Vehicle wheel, W. C. Rastetter 694,192
Velocipedes, utilizing power in, A. Gibbs .. 694,264
Wagon spindle, C. Putnam 693,903
Washing machine, H. P. Dennis et al 693,846
Washing machine, J. H. Ellis 694,143
Watch movement holder, F. Leach 694,165
Waterproof garment, S. H. Emanuel 694,262
Water tube boiler, W. Wingerter 693,937
Wave or tide motor, W. Borchert 694,242
Weather strip, F. M. Cannon 694,135
Weather strip and guide for windows, H. E. Kenny 694,062
Weighing machine, F. Wertenbruch 694,222
Wheel, J. T. Ashley 694,231
Whiffletree clip, J. Curry 694,254
Windmill, E. Plagmann 694,300
Window guard and shade attachment, T. Euphrat 693,957
Window screen, S. W. Benson 693,993
Window screen, E. L. Lloyd 694,319
Window screen, sliding, J. B. Feather 694,095
Wire from one reel to another while same is being polished, apparatus for winding, A. Guimond 694,011
Wires together, clip for securing, Hulse & Schramm 693,866
Wood, preserving, I. B. Sprague 694,212
Wood, producing artificial, F. Helbing 694,014
Work bench, portable, D. F. Barber 694,312
Wrapping machine, package, J. T. Pedersen 694,026
Wrench, J. H. Hobson 693,861
Writing machine, E. B. Hess 694,015
Yoke fastener, neck, C. M. Schanz 694,202
Zinc furnace, Convers & de Saulles 694,137
Zither support and sounding device, J. A. Duerst 694,094

DESIGNS.

Brushes, mirrors, etc, back for, A. Geiges .. 35,770
Chair, C. W. Clark 35,779
Dental instrument cabinet, F. E. Case 35,776
Dish, ornamental, W. E. Carlson 35,771
Lens, cylinder, G. W. Wells 35,769
Pin blank, stick, H. R. Steele 35,768
Rug, A. Petzold 35,778
Tile, ornamental, T. J. Woodward .. 35,772 to 35,775
Type, font of printing, H. Ihlenburg 35,777

TRADE MARKS.

Antiseptics, R. H. Page 37,867, 37,868
Belts, chain, Link Belt Machinery Co. 37,877

(Continued on page 178)

Blacksmiths' tools, certain named, Columbus Forge & Iron Co	37,876
Blood specific, A. J. Baxley	37,864
Boots and shoes, Greene Shoe Co	37,846
Corsets, Kops Bros	37,841
Corsets, Weingarten Bros	37,842
Cream of tartar, Royal Baking Powder Co	37,851
Disinfectant and preservative, Farbenfabriken of Elberfeld Co	37,869
Fertilizing purposes, refined nitrate for, Lautaro Nitrate Company	37,871
Food, breakfast, S. P. Ayres	37,850
Furniture spring work, Staples & Hanford Co	37,880
Furniture spring work, Sprinklock Spring Bed Co.	37,881
Gas generators, acetylene, J. de Dios, Tejada	37,879
Glass lamp chimneys, reflectors, and lantern globes, Bill Brothers Company	37,875
Glassware, electrical, C. S. Knowles	37,874
Hose supporters, A. Steinhardt & Bro	37,844
Laxatives, Chester Kent & Co	37,865
Leather, patent and enameled, Hugh Smith	37,848
Medical composition for external application, J. Schwarz	37,866
Medicine, certain named, Peacock Chemical Co.	37,862
Medicines, cough, Tar-Ben Medicine Co	37,861
Paints for exterior and interior finishing, Geo. W. Pitkin Company	37,873
Paper and envelopes, writing, Z. & W. M. Crane	37,838
Papers, sensitized photographic, B. Russegger	37,837
Pictures, V. Waring	37,839
Remedies, blood, liver, and kidney, Balsam Medicinal Co.	37,863
Respiratory devices, mechanical, M. J. E. Hurlbut	37,870
Shoes, George H. West Shoe Co	37,847
Shoes, ladies', Lindner Shoe Co	37,845
Silks, dress, Liberty Silk Co	37,840
Stiffeners for flexible goods, A. A. Dieter & Co.	37,849
Suspenders, Nashawannuck Manufacturing Company	37,843
Tonic and medicinal food, J. Herb	37,859
Tonic and restorative medicines, Bendiner & Schlesinger	37,858
Tonic, antiperiodic, and antipyretic preparation, A. H. Still	37,860
Tonics, I. W. Douglas	37,857
Turpentine, mixed, John A. Casey Company	37,872
Washing machines, hand, Vandergrift Mfg. Co.	37,878
Watches, watch cases, and watch movements, United States Watch Co	37,836
Whisky, J. Buchanan	37,852, 37,853
Whisky, A. Ferguson & Co	37,856
Whisky, Scotch, J. Caldwell	37,854, 37,855

LABELS.

"Blue Lion 36-Inch Percale," for percale, H. B. Claflin Company	8,981
"Chlorothol," for anodyne, J. W. Van Winkle	8,984
"Diections," for toy bird, Lexington Toy Bird Co.	8,979
"Grape Sugar Flakes," for cereal food, Commercial Travelers & Farmers National Food Co.	8,988
"Home Brand," for asparagus, Griggs, Cooper & Co.	8,990
"Home Brand," for baked beans, Griggs, Cooper & Co	8,989
"Home Brand," for maple sugar, Griggs, Cooper & Co	8,992
"Home Brand," for olive oil, Griggs, Cooper & Co.	8,993
"Home Brand," for soda, Griggs, Cooper & Co.	8,991
"Johnie Bird, for cigars, Schmidt & Co	8,986
"Marca Vuelta," for cigars, Schmidt & Co	8,985
"Red Lion 36-Inch Percale, for percale, H. B. Claflin Company	8,982
"Sunlight Soap," for soap, Lever Brothers	8,994
"System Lenox," for garments, Gimbel Brothers	8,980
"The Appetine Stomach Tablet," for stomach tablets, J. W. Stahlberg	8,983
"Whegn," for food made from wheat, Whegn Food Company	8,987

PRINTS.

"A Winning Pair," for wine, White Top Champagne Co	470

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 10 cents, provided the name and number of the patent desired and the date be given. Address 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. For terms and further particulars address Munn & Co., 361 Broadway, New York.

GEOLOGY OF THE CITY OF NEW YORK. By L. P. Gratacap, A.M. New York: The Author. 1901. 8vo. Pp. 82.

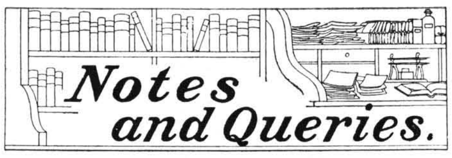
The author has prepared this work on the geology of Greater New York for use in schools, institutes and classes. As he holds an official position at the American Museum of Natural History, his facilities for obtaining material for his work are naturally excellent. The glacial erosions which he illustrates are particularly interesting.

A GUIDE TO THE WILD FLOWERS. By Alice Lounsberry. Illustrated by Mrs. Ellis Rowan. New York: F. A. Stokes Company. 1899. 12mo. Pp. 347. Price $2.60.

The work has 64 beautiful full-page colored plates showing 79 different plants and 100 black-and-white plates showing 103 plants, together with 54 diagrams. It contains descriptions of nearly 500 plants. It is complete in itself, employing no technical terms which it does not itself define. It is arranged according to the kind of soil in which the plants grow, the most natural classification. Mrs. Rowan is justly noted as a thoroughly accurate painter of flowers.

MANUFACTURE OF PAINT. By J. Cruickshank Smith, B.Sc. London: Scott-Greenwood & Co. New York: D. Van Nostrand Company. 1901. 8vo. Pp. 200. Price $3.

Literature upon paint-making is so limited that any addition to it will be warmly welcomed, especially when it is such an excellent work as the present. The author shows that he has a thorough and practical understanding of the subject. The volume is intended for the use of paint makers, primarily, but its contents will interest all dealers in the article. The practice is, of course, English practice, but it is doubtful if it varies very much from American practice.



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.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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.

(8546) L. L. P. writes: We have an angle iron tower 100 feet high on which is a 50,000-gallon tank. Miscreants annoy us by climbing to tank. Electric light and trolley lines are near: how best connect them to tower to give a good stiff shock, and what size wire should we use? A. You can connect your tank to the electric lines you mention, but you will render yourself liable for the injury or death of anyone who may be connected to the circuit through your act. A man does not render himself liable to be murdered by climbing a neighbor's tower. It is simply a trespass, which has no so severe a penalty in the law. There are other ways of meeting the case.

(8547) E. S. D., Jr., writes: 1. I would like to know if you could give me the formula for a solution for bichromate cells, with a good ampere output, in the right proportions, and how to mix it, etc? A. A good solution may be made after the method described in SUPPLEMENT No. 792, price ten cents. 2. Which is the best form of bichromate to use for making electropoion fluid—the sodium or the potassium? A. The sodium salt is easier of use. 3. What is the best way of amalgamating a zinc? A. The usual method is to clean the plate with dilute sulphuric acid, and then rub mercury over the plate, dipping it into the dilute acid if necessary to make the mercury take to the surface. 4. I would like to know if I could have a battery rheostat made for these batteries, steady current, etc.? A. Yes; though there is little need of one. The amount of current can be regulated by immersing the zincs to a greater or less depth in the liquid.

(8548) W. G. S. asks: 1. What is the output in amperes of the common telephone battery called sal-ammoniac battery? A. The Leclanche cell gives probably 3 amperes as a maximum discharge rate. 2. Also of the dry battery called the 1900, and does the size of the battery govern the number of amperes? A. A dry battery has a small discharge rate. The amperes of discharge of any cell are greater with a large than with a small plate. 3. Also give output in amperes of the common Crowfoot gravity battery, 6x8 size. A. You will not be far wrong to take the discharge of the gravity cell at two amperes. 4. Where can I get a table giving the above information? A. Most cells are rated in Carhart's "Primary Batteries," price $1.50 by mail.

(8549) M. P. C. asks: 1. What metal is next in quality to platinum for contact pieces in a bell, induction coil and a telegraph key? A. There is no metal which can take the place of platinum for this use. There are several which have higher melting points, but they cost from five to ten times as much as platinum and the price prohibits their use. Most metals oxidize too easily to enable them to be used for contact points. 2. Does carbon or graphite make a good contact? A. No. They are too brittle, and would soon be broken in pieces. 3. How many pounds of wire should be wound on the armature and field magnet of the hand power dynamos described in SUPPLEMENT No. 161? A. The winding calls for so many turns, not so many pounds. 4. Is this dynamo suitable for running a motor? A. Yes, a small one.

(8550) L. & G. asks: We have a small motor wound for 25 to 30 volts, which we would like to utilize in running a small job press which we are at present running by foot. Would it be advisable to use a battery of the Grenet cells; or would the cost of maintaining them be too high? A. The voltage is only one element in determining the output of a battery, and in rating the power required to run a motor. To furnish the voltage for your motor will require 16 bichromate cells. The type described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 792, price ten cents, is best adapted to this purpose. The size of cell therein described will doubtless be large enough to run motor. One charge will last six hours. You can determine the cost from the price of bichromate of soda or potash and sulphuric acid at your place.

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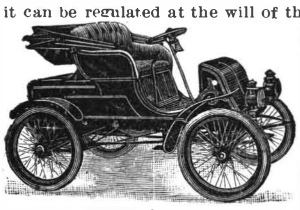

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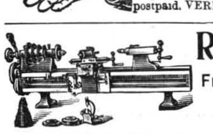

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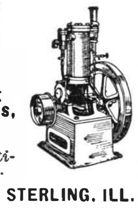

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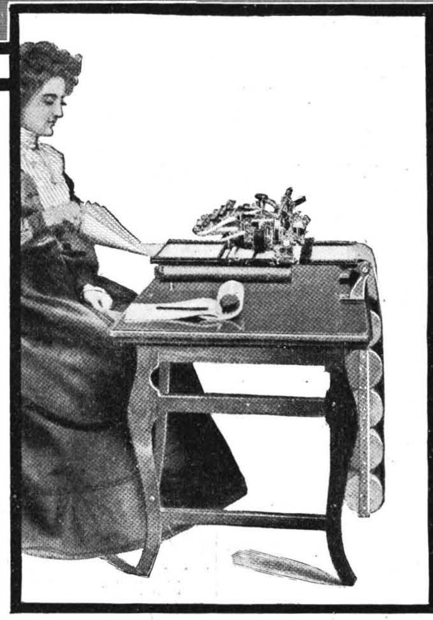

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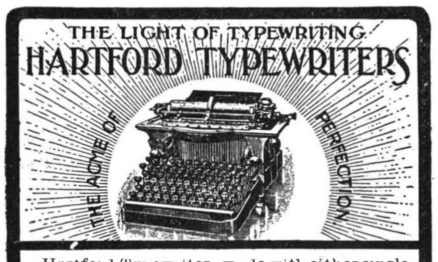

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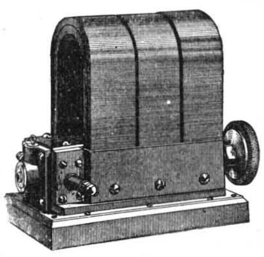

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