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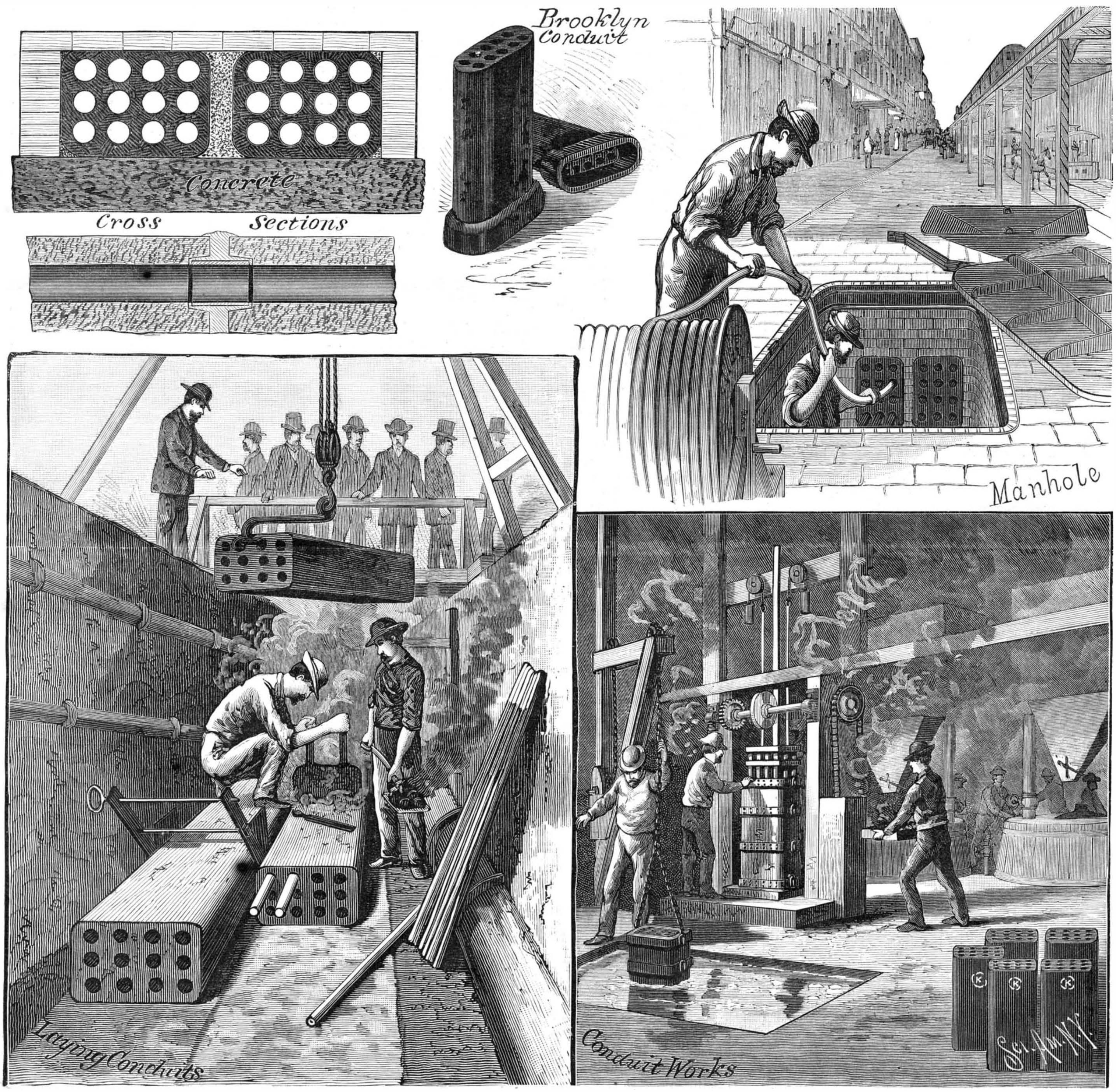
THE ELECTRIC SUBWAY CONDUIT IN NEW YORK.

Nearly a year and a half have passed since the subway commissioners were appointed, under a special act of the Legislature, to supervise the burying of the telegraph lines in this city. To do this work intelligently, a special study of the subject was required, together with a comparison of the different methods proposed by inventors. As the telegraph companies had done nothing to further the objects of the commission, a subway company was formed. This company, receiving its franchise from the commissioners, is now engaged in laying the conduit.

The material of which it is composed is a mixture of three to four parts of coal-tar pitch to one of sand. This is moulded into prismoidal blocks, three feet long, each block containing twelve longitudinal apertures, 2½ inches in diameter. Each of these apertures can accommodate a cable containing one hundred telephone wires. Their manufacture is thus conducted: Sand is received at the factory and screened carefully. As fast as screened it is introduced into a long inclined cylinder, through which the products of combustion from a furnace pass on their way to the chimney. This cylinder, about eighteen inches in diameter and fourteen feet long, contains projecting pieces running lengthwise along its inner surface. These pieces are four inches wide and eighteen inches long, and, as the cylinder revolves, pick up and drop the sand, which emerges at its lower end quite hot and perfectly dry. Thence, by a chain and hopper elevator, it is carried up to a second floor, where it is placed in receptacles provided with steam coils, by which it is again heated. It is fed as fast as needed through spouts into mixing tanks on the lower floor. Melted pitch is fed in the same general way into the same vats, and the mixture is thoroughly stirred by rotary blades within them. The peculiarity of the process up to this point consists in the use of hot sand. About thirty per cent is present in the completed mixture. The blocks are formed in moulds from the hot material by ramming.

In addition to top and bottom plates, each mould consists of two parts, which are secured by lugs. When these two parts are joined, they form an open-ended prismoid. This is set up on end within the ramming apparatus, as shown in the cut. Twelve iron mandrels have first been projected upward from the base through the bottom plate, and are well oiled by swabs applied by hand. The mixture is introduced by boxes of the same outline as the blocks, and provided with removable bottoms. The filled box is placed over the open end, and its botton withdrawn, its contents falling into the mould. After six or eight inches have been filled, the rammer is set to work, and a rapid succession of

(*Continued on page* 228.)



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NEW YORK, SATURDAY, OCTOBER 9, 1886.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 562.

For the Week Ending October 9, 1886.

Price 10 cents. For sale by all newsdealers.

"THE REMEDIES OF NATURE."

In a series of papers on "The Remedies of Nature," an eminent English physician comments upon past and present medical treatment; and though presumably it is the intention of these papers to convey important and timely information to the medical faculty, they furnish at the same time a hint to the patient at large which, if he be wise, he will hasten to avail himself of. Perhaps it is the author's intention that he should, for at one moment he seems to drop his voice to a whisper while admonishing the fraternity that they must stop dosing and drugging, and at another talks in stentorian tones over their heads, warning the public to look to nature rather than to art for relief from all the minor ailments to which humanity is heir. It may, perhaps, be a disappointment to them who have come to lean upon their medical adviser for advice and rely upon him for health, to learn that the effects of fresh air are more potent and enduring than artificial stimuli, and exercise more to be depended on than jalap, attenuations of aconite and belladonna, or even bread pills. He inveighs against the practice, now unhappily prevalent, of attacking the effects or outward signs of a disease instead of the cause or seat of the malady—a practice which sometimes proceeds from ignorance, though it is often adapted to allay the fears of the patient.

"A swelling suddenly appears on a man's knee, whereat," says the author, "he flies in alarm to his physician. The latter sets himself diligently to work to remove the swelling, and, to the joy of his patient, succeeds."

This, he says, is like stopping the alarm bells which tell us that a fire is broken out. We should be attending to the fire and let the bells ring. The swelling on the man's knee might not, it seems, be a disorder in itself, but only the outward expression of a real trouble existing within—a warning given by nature, and perhaps an outlet, which, if encouraged rather than restrained, might do much to alleviate the disorder of which it is the expression.

He does not believe in giving drugs and medicines of any kind—he does not refer to simples—save in extreme cases, because their use puts an extra tax on the strength of the patient, who, after recovering from the original malady, must also recover from the effects of the foreign substances that have been taken into the body or injected under the skin.

A man, woman, or child who will take a fair proportion of fresh air and exercise daily will not fail to be benefited in health. The effects of fresh air and exercise, when taken continually, would seem exaggerated if set down here—let those who may be interested inquire at the nearest gymnasium.

McClellan, the boxing-master at Woods' Gymnasium, in New York city, said recently to the writer: "The doctors couldn't do anything for Mr. —— (once a confirmed invalid). I took hold of him, made him box with me; a very little at first, increasing the amount of the exercise as the weeks went by, until now he is quite recovered, goes to his office every day, and walks up and down town in all weathers. He eats well and sleeps well—it all came along of the boxing."

This man used to be surrounded by bottles containing medicine, like an apothecary's clerk in a compounding room. He took something out of one bottle when he got out of bed in the morning, and helped himself from others before and after each meal. The more medicine he took the feebler he appeared. One malady seemed only to pave the way for another, ache followed ache, what brought relief to one ailment added to the intensity of another, and he soon found that thus to seek for health by way of the materia medica was, like the first inhabitants of Arcadia, to chase the sun, which, when they had reached the hill on which it seemed to rest, was still beheld at the same distance from them.

It is not intended to cast a reflection upon those estimable and skillful physicians to be found to-day in almost every community, who are quick to recognize symptoms, adroit in lessening pain, and with whom the saving of life is a common incident. But many, perhaps it is safe to say most physicians, do little to encourage the ailing to rely upon their own exertions for relief, rather than upon medicines, which at best can afford but a temporary respite from suffering and disease.

A New Railroad Signal.

Elsewhere in this issue we illustrate and describe a railroad signaling device which contains a number of elements for safety that render it deserving of special attention. At the end of each section is a clock, which shows the exact time of the passing of the preceding train.

The opening of either a drawbridge or switch automatically places a danger signal before the face of the clock. This signal cannot be removed except by the closing of the draw or switch. Should the line become blocked, the danger signal can be displayed to warn approaching trains by a trainman pulling a wire extending along the side of the track.

These and other safety operations are performed by simple mechanical devices.

Beautifying the Skin.

The *Southern California Practitioner* tells us that in the work on diseases of the skin edited by Professor Von Ziemssen, Dr. Heinreich Auspitz, of Vienna, makes the following observations upon this subject:

1. A healthy integument is not necessarily beautiful. Even if all requirements concerning diet, residence, atmospheric and climatic conditions, etc., are carried out, the complexion is often extremely bad. The general condition of health has no influence upon the beauty of the complexion, though it has upon the health of the skin.

2. Cleanliness is a *sine qua non* of the beauty of the complexion, though it does not play a great part in the health of the skin.

3. Water is serviceable to the skin in only moderate amounts and at moderate temperatures. Very cold or warm baths, when used to excess, diminish the elasticity of the skin and its power of resistance to external irritatants.

4. Distilled and so-called soft water are more suitable for washing, and less irritating than hard water.

5. The hard soda soaps are usually preferable to the soft potash soaps for toilet purposes. The quality of soaps depends upon the quality of their constituents and the thoroughness of their saponification. Good soaps must not contain free alkali or any foreign irritating substance. The addition of moderate quantities of perfumes does not materially change the quality.

6. Simple, finely ground powders, such as starch, magnesia, etc., are entirely innocuous, and often act as a useful protection against external irritants.

7. Frequent application of alcohol abstracts the water of the skin, makes it dry and brittle, and impairs its nutrition. This is also true of glycerine. All toilet washes containing alcohol to any considerable extent should be avoided.

8. This is true to a still greater extent of other additions to washes, such as corrosive sublimate, mineral acids, certain metallic salts, etc.

9. Camphor acts merely as a bleaching powder. This is also true of benzoic resin, sulphur flowers, and substances containing tannic acid.

10. The use of sweet-smelling oils and fats should be employed to a greater extent than is now done for toilet purposes.

11. This is particularly true with regard to the growth of the hair. The nutrition of the scalp should be increased by the rational application of fat (for example in the form of oil baths, by means of the application at night of a sponge soaked in oil upon the scalp) and the greater use of simple pomades. These should be applied to the roots of the hair, rather than the shafts.

12. Substances should be avoided, or sparingly used, which abstract water from the skin and the roots of the hair.

Prevention of Accidents.

The whole tendency of modern industrial progress is in the direction of abolishing manual labor in manufactures, and substituting for it machinery, which is being constantly improved, and which in the not distant future may be expected to reach still higher stages of perfection. The result of this change in the methods of production, of course, necessitates the use of considerable power, and the rapid movements of belting and gearing expose workmen to dangers to which in earlier times they were not liable. In this country the legislature has for a long time shown that it considered employers of labor to have duties to perform in seeing that those in their pay should run no unnecessary risks. In France, however, no attempt was made to deal with this matter until 1874, when inspectors were appointed with power to order changes in factories, with a view to the protection of children. This, however, was found insufficient, and in 1884 a law was passed making the employer responsible for accidents, except in cases where he could prove that they were due to carelessness on the part of the workman.

In addition to this, to provide for that class of risk which may be described as inseparable from the trade, compulsory insurance has to be effected, one-half of the premium for which has to be paid by the employer and the remainder by the workman. A further proposal is now made to improve the sanitary arrangements of workshops, as well as to bring about increased safety. In Germany and Austria similar enactments are in force. In France, however, a useful initiative has been taken by certain unions, in which are representatives of all kinds of industries, who have inspectors of their own, and who form a kind of council, at which full consideration can be given to the best means of preventing accidents. Thus, the engineers of one association have taken, one by one, all machines of a dangerous character, and entered minutely into the best means to be adopted for rendering them safe as far as possible. These proceedings have proved very beneficial, and have not only had a local effect, but the recommendations have been adopted in surrounding districts. The idea is one worthy of notice, as tending to prevent over-legislation, which not infrequently has a harassing influence upon business.

The Maxim Automatic Machine Gun Works.

The friends of H. S. Maxim, who acquired considerable of a reputation in electric lighting appliances, when residing in this country, will be glad to know of his success in London with an automatic machine gun of his invention. The *Mechanical World*, of London, describes Mr. Maxim's experimental works: This factory, which is situated at 57D Hatton Garden, London, has been started solely for the purpose of carrying out experiments with the automatic machine guns of Mr. Maxim. It will be readily understood that an invention of this nature, with its endless applications, would necessitate a large amount of trial work in perfecting and improving it. The works, although of the nature described, are of considerable extent, occupying five floors, and employing some 45 hands, besides eight draughtsmen engaged in designing the numerous patterns of machine guns to be made. These works are devoted entirely to the prosecution of experiments in connection with the application of automatic firing mechanism to all sorts of weapons, from a pistol to a cannon, on the Maxim system. It is not, therefore, in any sense a manufacturing establishment. But once the work of experimenting, now lasting over three years, has been sufficiently completed, guns of various patterns will forthwith be manufactured on a large scale. Several large orders, we understand, await execution, and doubtless the demand for them is likely to be considerable.

On the ground floor of the building are a number of the ordinary tools common to an engineering establishment, including a small planing machine, three lathes, a milling and drilling machine, etc. On the first floor are some larger tools, such as a fair sized planing and slotting machine, a shaping machine, a pattern maker's lathe, a smith's forge, emery wheels, etc. In the large lathe here at the time of our visit there was being turned up the outside brass casing of a three pounder gun. There was also to be seen several other guns, some in progress and others finished. The guns now being made are a great improvement on the one Mr. Maxim had at the Inventions Exhibition, both as to simplicity of mechanism and weight.* The gun in question fired over 600 shots per minute. We had the opportunity of firing a small gun weighing 32 pounds, whose rate of fire is 600 shots per minute, and certainly nothing could well be simpler than the handling of it. It has already fired 20,000 rounds without a single failure. A Nordenfelt gun, to fire the same number of shots per minute, we were informed, would weigh 100 pounds more, and a Gardner gun of the same shooting power would be some 428 pounds heavier. These latter have also to be mounted on much heavier stands, which adds greatly to their cost.

In firing the Maxim machine gun, the barrel is kept cool by the circulation of cold water, which enables a large number of shots to be fired at a time. A pint of water for every 1,000 cartridges is about the quantity required to absorb the heat evolved. Here may be seen the smallest machine gun ever made—a military automatic repeating rifle, carrying a magazine of ten cartridges, which it will fire at the rate of ten in 2½ seconds. It has the external appearance of an ordinary gun. As to size, the Winchester repeating rifle, which has for many years been regarded as the standard magazine gun, when full cocked presents a body four times the length of the cartridge and a depth equal to one length of cartridge, while the Maxim machine gun has a body only 2½ times the length of the cartridge and a depth of three-quarters the length of cartridge. The shoe, or body, of this rifle carries the mechanism.

Drawings are in hand of a 100 pounder gun, about to be made. It will fire a shot of 100 pounds with a powder charge of 50 pounds, at the rate of 25 per minute.

Another machine gun of a somewhat different type, which we saw, deserves mention. It is intended to give a scattering fire with a very heavy charge of powder. The projectile is made in a peculiar manner, so that when four small cuts are made on the surface of the bullet by cutters in passing out of the muzzle it flies into 19 distinct pieces, which are scattered in all directions. It is capable of discharging these missiles at the rate of 3,000 per minute, and is intended for long range firing, capable of penetrating the shields of any machine guns, and will be able also to cope with ordinary field artillery. This gun will in every way be a very formidable weapon.

In the drawing office there is a shield machine gun mounted on wheels, which serve not only to transport it from place to place, but are so arranged as to swivel round, so that the forward edge of the wheels converge toward each other and close up to the front shield, forming a complete protection for the gunner.

The whole machine is extremely light, compact, and easily handled. The wheels are made of slightly dished steel plates cut to the desired diameter, having a rim of angle iron riveted to their circumferences.

On the top floor of the building are to be found a number of machines for light work: Four lathes, three shaping machines, two drilling and one milling machine; also two profiling machines, a gas forge, a small muffle furnace, grinding and polishing machines. In fact, there is a very complete equipment of tools for producing accurate and well finished weapons. An interesting machine in operation in one of the workrooms is a very ingenious piece of mechanism, the invention of Mr. Maxim. Its purpose is to make the carrying belts for the cartridges. These belts are made from double strips of stout cloth, spaced off to suit the size of cartridge for the particular gun. The spaces are portioned off by the machine and a thin brass plate placed on both sides of the band at regular intervals, and then fastened together by three eyelets in the width. The machine punctures the cloth without cutting the fiber, by the passage of three tooth-like projections, which carry the eyelets. These are next riveted over and hold the cloth firmly. One man works the machine, which completes each operation separately and, it may be said, automatically. These machines, when in regular work, will be attended to by girls.

The guns to be seen here are extremely interesting from a mechanical point of view, as well as the process of manufacture and the tools employed. The Maxim machine gun is bound to play a very important part in future military operations, and will probably greatly alter the condition of machine gun warfare. When the various patterns and sizes have been fully and finally determined upon, their manufacture on a large scale will be proceeded with at once.

Mr. Maxim has in his office a number of fine photographs of his various guns, also some parcels of cartridges which had been fired from the Maxim gun by distinguished personages, among whom were the Prince of Wales, the Marquis of Lorne, Lord Alcester, Lady Bramwell, and others.

* See SCIENTIFIC AMERICAN SUPPLEMENT, No. 494, for illustration of Maxim's, Nordenfelt, Gardner's, and a number of other machine guns displayed at the exhibition.

A Great Negative.

In the early part of June of the current year, the news was wired from Boston to all parts of the country that a local photographer, Mr. T. R. Burnham, had produced the largest dry plate negative ever attempted, the success being in every respect complete. As a natural consequence, the author of the big picture was quickly sought out, interviewed, and questioned, and experts very soon discovered that it was not a mere sensational report, but an accomplished fact. There was the huge negative, representing a life-size three-quarter length portrait of a young lady, and measuring 3 by 5 feet—36 by 60 inches. The weight was over eighty pounds, the thickness of the glass about half an inch. The plate was coated expressly for the occasion by Messrs. Allen & Rowell, of Boston, professional photographers of high standing, and manufacturers of an excellent brand of dry plates, who declare that the task imposed upon them was a most difficult one, as can well be imagined. And the amount of labor required in developing the huge plate was something they had not anticipated, and are not anxious to experience again. The trays had to be specially made, and the quantity of developing solution is said to have been over three pailfuls. Everything connected with the undertaking had to be done on a large scale. The camera, though not a model of compactness, such as fastidious amateurs dream about, was homemade, and constructed by Mr. Burnham himself, the lens used on it being a No. 8 euryscope, the largest of that class made.

The upright focusing screen consists of two lights of ground glass divided by a bar running across, similar to a window, the height being such as to necessitate the use of a pair of steps in focusing the image. Thus the "largest camera in America," furnished by a well-known manufacturer to a Boston amateur, and which accommodates a 24 by 36 plate, is effectually eclipsed. As to the picture itself, which was exhibited at the St. Louis Convention, and seen to advantage by admiring groups of photographers, nothing short of sincere praise can be bestowed upon it. Made with Voigtländer's euryscope No. 8, in twenty seconds, and fully timed, it possesses all the merits of a first-rate photograph, notwithstanding its huge proportions. The definition is adequately clear and surprisingly even all over, showing how skillfully the focus was divided—the most important factor in the production of large pictures, whether heads, figures, or groups, and in which particular many photographers fail, in spite of the excellence of the instrument employed. The most gratifying feature of the print, however, is the illumination, which is brilliant, searching, and almost phenomenally uniform, extending, as it does, to the very edges, showing, too, that the covering capacity of the lens was not taxed in the least, and that even a larger picture could be produced under similar conditions. Then, too, the lens in its original form was used, and not one of the combinations, as has been intimated by some biased or inexperienced critic. Had this been the case, it is very doubtful if the feat could have been accomplished, as two very serious obstacles would have presented themselves, namely, the doubling of the focus and the doubling of the time of exposure. The negative was printed in the usual way on a single sheet of Morgan's albumen paper, 36 by 60. In producing this picture, Mr. Burnham was actuated by a desire merely to illustrate the undiscovered powers of the instrument, at the same time to put to flight the occasional "photographer of experience," who claims that the same sized lens fails to cover a 20 × 24 plate satisfactorily! The proof to the contrary in this instance is a most convincing one, and must be of enduring benefit to those gentlemen who are identified with the use or sale of these favorite and powerful lenses. Last, but not least, is the artist himself. It is greatly to his credit that, in spite of the appeals of his friends to desist from so "foolish" an attempt, and the failures and expense staring him in the face, he manfully persevered, quietly making his preparations at considerable cost, and then suddenly announcing to the world his unequivocal success.

Mr. Burnham was justly awarded one of the Association's special silver medals for his remarkable production, which required a rare combination of enterprise, pluck, and skill. The negative is at his studio in Boston, as well as one of the direct prints.

The Mechanic Arts of Cornell.

Cornell University, as the readers of the SCIENTIFIC AMERICAN learned last year, through the very fully illustrated description of that institution and of Sibley College, its college of mechanical engineering and the mechanic arts, given in our issue of Oct. 7, 1885, has, of late, been evincing a very strong determination on the part of its governing boards to carry out effectively the provisions of the law and the charter on which it is founded by making very complete arrangements for the prosecution of its "leading" work, the promotion of learning in the direction of the useful arts. The result is reported to be gratifying beyond all anticipations.

The University shares more than fully in the prosperity of the colleges of the country generally, and has now nearly 800 undergraduate students, with the prospect of rounding the full figure before the influx ceases for the year. The freshman class contains above 300 men, and is probably the largest that ever entered an American college. The roll of higher classmen and of graduate students pursuing postgraduate studies is also reported to be extraordinarily increased. The faculty have made unusual efforts to provide strong courses for such advanced work.

It is especially gratifying to all who are interested in the current changes in the direction of improved technical education to learn that the technical courses are found even more attractive than the academic. The classes entering the Sibley College courses in engineering constitute about one-third of the new class, and the technical departments, all together, receive about one-half of all the new men. How much of this unexampled growth of Sibley College and allied departments of the university is due to the extraordinary facilities provided and promised by the trustees, how much to the form of organization and methods of administration perfected by the director, and how much to the very thorough manner in which the public has been advised of what was in progress, as, for illustration, through the columns of the SCIENTIFIC AMERICAN, no one can say; but we hope, at least, that we may claim some share in what is certainly a most gratifying progress in technical education.

It is said that our views of the buildings of Sibley College, if not of the University buildings, will probably not be correct for another year. The present structures are overcrowded, and the woodworking shop, if not the whole establishment, must probably be doubled in its capacity, if they are to accommodate comfortably the coming classes. The country is evidently entering upon an era of extraordinary prosperity, and our colleges are among the first to present proofs of the change. We may probably expect a continuance of this tendency of young men to want practical as well as disciplinary studies. It may, indeed, be well doubted whether we are not just entering upon a new period of advancement in all educational work.

The Recent Eclipse of the Sun.

At Grenada, August 29, during the solar eclipse of that morning, good photometric observations were made by Prof. Thorpe. The light during the middle of totality was less than from the full moon. The eclipse was well observed by the British Astronomical Expedition, and in the observations taken it was noticed that the corona extended nearly two diameters from the sun, and exhibited a feathery structure at the poles. Good photographs have been obtained of the coronal spectrum in the blue end. The spectrum was similar to that of the eclipse of 1883, observed on the Caroline Islands.

THE receipts of the Patent Office for the year 1885 exceeded the expenditures over $163,710, while the balance on hand January 1, 1886, was $2,945,405.58; and yet the Commissioner of Patents cannot get Congress to appropriate a sufficient sum out of the surplus patent fund to enable him to employ a sufficient examining force to keep up the work of the office. It does seem as if the majority of our legislators fail to realize the importance our Patent Bureau is to the country.

IMPROVED RAILWAY SIGNAL.

The system of railway signaling herewith illustrated presents many features which may be studied with advantage by those interested in the careful running of trains. The various operations of this method—all of which are positively automatic—may be enumerated as follows: A train in passing the signal moves the hands of the clock to the XII mark; the clock then runs as an ordinary one, marking the time from XII, which is considered zero. When the next train arrives, the engineer notes upon the clock the time which has elapsed since the passage of the preceding train. The opening of the switch or the turning of the bridge throws a red danger signal in front of the face of the clock, which of course may be placed at any desired distance from the switch or draw and at any height above the track. When so set the danger signal cannot by any means be removed from the face, except by the closing of the switch or draw.

The tube which carries the minute hand is provided with a heart cam (shown in the detail view), the notch or point of least eccentricity of which is exactly in line with the hand, so that when the arm of a lever is brought down upon the cam by a passing train, through the intermedium of mechanism described below, the tube will be turned to set the hand back to the XII mark. A similar device also sets the hour hand back to the starting point. This simple arrangement causes the lever when depressed by the downward movement of the operating bar, B, to act upon the heart cams and reset the hands accurately back to XII, no matter what position they may occupy at the time upon the dial.

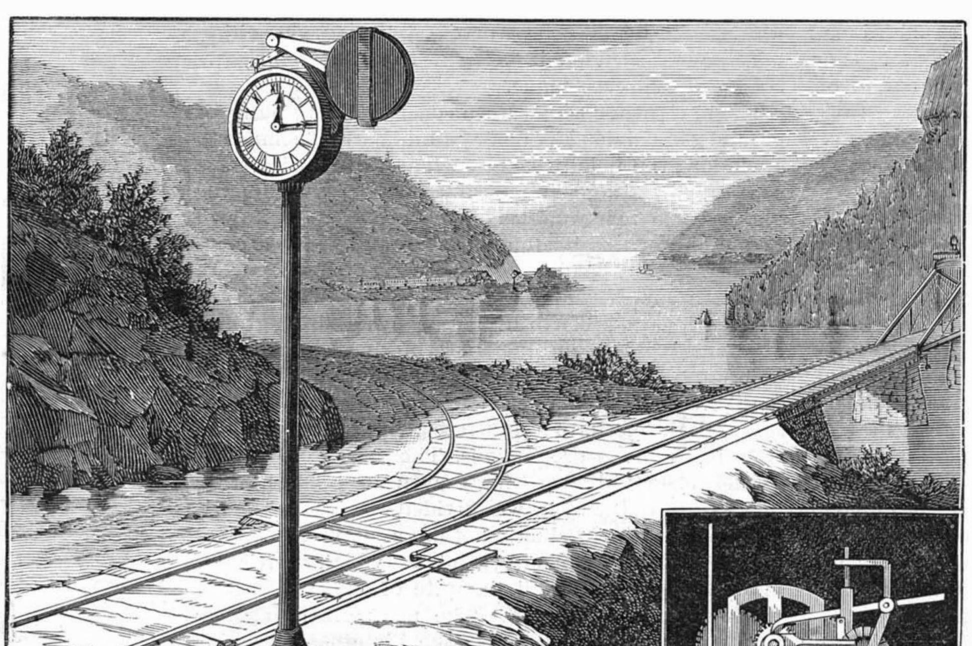
At the time the lever is operated to set back the hands the tubes carrying the hands must be free to turn upon their spindle independently of the clock mechanism; and after the resetting the tubes must again connect with the clock mechanism as soon as the lever is elevated out of contact with the heart cams, so that the hands will then be moved to indicate the interval of time between trains. The device for accomplishing this is simple in construction, accurate, and not liable to get out of order. The operating rod, B, reaches down through the hollow standards, and it acts by gravity, which is one of the principal features of this system, so that the signal mechanism is entirely relieved of excessive shock by passing trains. Normally, this rod rests upon a lever, which is connected to a shaft set at the side of the track and provided with a crank, arranged near the rail, to be depressed by passing trains, which will lower the forward end of the lever and permit the rod, B, to drop, and thus operate the clock mechanism.

This shaft, after the passing of each train, may be returned by a weight or other suitable device to cause the lever to lift the bar, B, ready for another action; but in order to make the lever dwell a short time after being depressed, to permit the train to pass on without each truck striking the crank and operating the signal, its outer end is connected by links and a slotted crosshead with the piston rod of a pneumatic clock cylinder, the spring of which returns the lever as the air slowly leaks out of the cylinder through a small opening. This construction is plainly shown in the perspective view. It will be understood that when the rear end of the rod is elevated by a passing train, the piston head will be moved in the cylinder to compress a spring, and at the same time air will be taken freely into the cylinder through an inwardly opening valve The air, when the piston returns, will close the valve and retard the piston a greater or less length of time, according to the size of the small escape opening.

The dial of the clock is transparent, and back of it is placed a lamp which serves to illuminate the signal and also to keep the interior of the casing warm, to insure the proper working of the clock in cold weather.

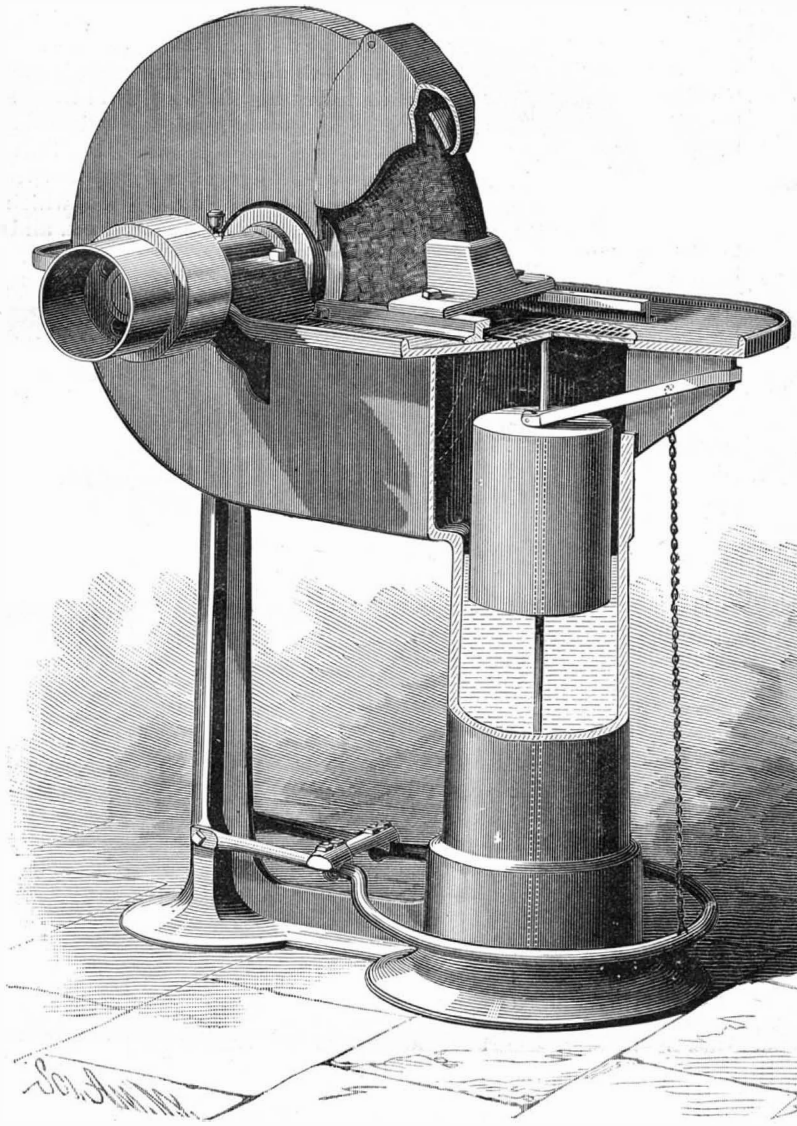
Connected with the casing by a casting is a semaphore, which is moved to a position in front of the dial or within its own case by means of the rod, A, which passes down through the hollow standard, and connects with a lever attached to a shaft provided with a pinion, beneath which is a rack adapted to be moved longitudinally for turning the shaft to operate the signal plate. This rack is connected so that, when the switch is opened, the signal plate is made to drop in front of the dial to indicate danger. The closing of the switch causes the plate to return within its casing. The signal plate is also arranged to be operated by the opening and closing of the drawbridge. The connections for making the movements of the signal are very simple and well designed, so that the reliability of the action of the red signal is assured. By lengthening the connecting rods, the signal post may be set at any desired distance from the switch or draw, so as to give the engineer ample time to stop his train, should either be open. Connected to the rack is a lever, to which is attached a wire running along the track; so that, in case of delay or accident between signal stations, a train hand can, by pulling this wire, display the signal to block oncoming trains.

This system of railroad signaling is the invention of Mr. W. J. Tripp, whose address is Grand Boulevard, between West 142d and 143d Streets, New York city, where a working model may be seen.



TRIPP'S IMPROVED RAILWAY SIGNAL.

IMPROVED EMERY GRINDER.



BARNES' IMPROVED EMERY GRINDER.

The accompanying engraving represents an improved method of mounting an emery wheel, which possesses advantages which are apparent at a glance. To the front of the treadle, which is pivoted to the rear standard and bent to encircle the water column, is attached a chain, leading to a lever whose free end carries a float. By pressing with the foot upon the treadle, the float may be made to enter the water chamber, thereby displacing the water and forcing it to rise and supply the wheel. When the machine is not in use, the float rises and the water settles back out of the way of the wheel.

This arrangement does away with all pumps and valves, which are liable to get out of order, simplifies the machine, and makes it more practicable under all conditions.

The chamber in which the float is suspended—resting upon the water—is divided from the chamber in which the wheel revolves by a partition, in the lower part of which is a small hole through which the water slowly enters the wheel chamber. Without this partition, the water would be flooded in to the wheel in a body or rush, which would not be desirable. The small hole being in the bottom edge of the partition allows all the water in the wheel chamber to flow back into the reservoir when the float rises. The curved treadle can be conveniently reached, no matter what position the operator may assume when grinding.

This construction not only greatly simplifies the machine and renders it far more efficient, but it also allows it to be used in shops where there is no piping, while it does away with the expense of piping in shops where there is no system of piping. This emery grinder is manufactured by the W. F. & John Barnes Co., of Rockford, Ill., who will furnish further particulars.

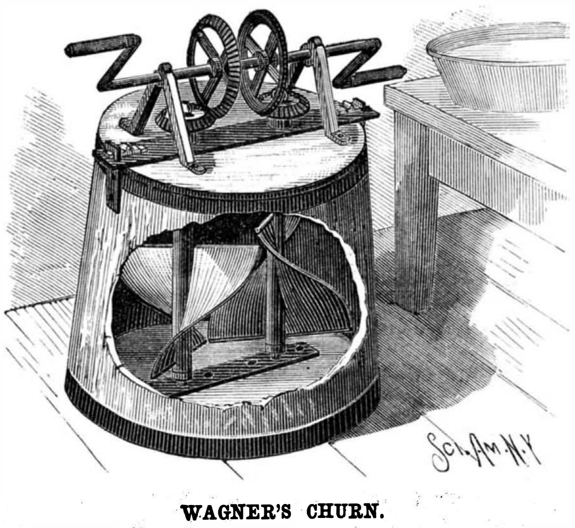
WINNECKE'S COMET.—A telegram from the Cape Observatory announces the discovery of the periodic comet known as Winnecke's on August 20th. It is a matter for congratulation that one of our royal observatories has a discovery placed to its credit, especially when it is remembered that an organized body of comet seekers exists. The observation at the Cape was made at 5:48 P. M. (Greenwich time) on Aug. 20, the comet then being in right ascension 13 h. 10 m. 21·5 s. and north polar distance 91° 8′ 17″, the daily motion being 3 m. and 32′ (both increasing). At the above time the comet was circular, about 1′ in diameter, with central condensation, but no tail, and about equal in brightness to a star of the tenth magnitude. This comet was first discovered in 1819, June 12, by M. Pons at Marseilles, and the period between successive returns to perihelion found to be about 5½ years. It, however, passed perihelion six times without being noticed, until Winnecke discovered it on March 8, 1858, since which date it has escaped observation on two returns, viz., 1863 and 1880, but was observed in 1869 and 1875. Some astronomers thought it probable that 1819 was not the first year of observation, but that the comet was the same as that discovered by Pons in 1808; but recent observations do not support this hypothesis.—*London Times.*

Prize for a War Ship Design.

The Navy Department offers a prize of $15,000 for the best design for a war ship.

AN IMPROVED CHURN.

The illustration herewith at once brings before the mind a clear idea of the mode of operation and the principles involved in the construction of an improved churn, recently patented by Mr. Henry J. Wagner, of Dayton, Cass County, Mo. In the churn cover are standards, in bearings of which is mounted a driving shaft, operated by the opposite crank handles, bevel



WAGNER'S CHURN.

wheels on the driving shaft meshing into wheels on the upper ends of two vertical shafts, and thus rotating the dasher blades. These dasher blades are secured spirally to the vertical shafts, each blade making a partial turn around its shaft, and are arranged at right angles to each other, so as not to interfere with each other on being rotated in opposite directions. By this construction, as the right hand shaft revolves, the cream passes up the spiral face and outward from the dasher blade, to be received by the spiral face of the dasher blade of the left hand shaft, revolving in an opposite direction, the air following the lower edge of the dashers, and the cream being thoroughly agitated by constant motion forth and back between the dashers. Such a churn is not expensive to make, and the operating parts are all easily removed.

IMPROVED CARILLON.

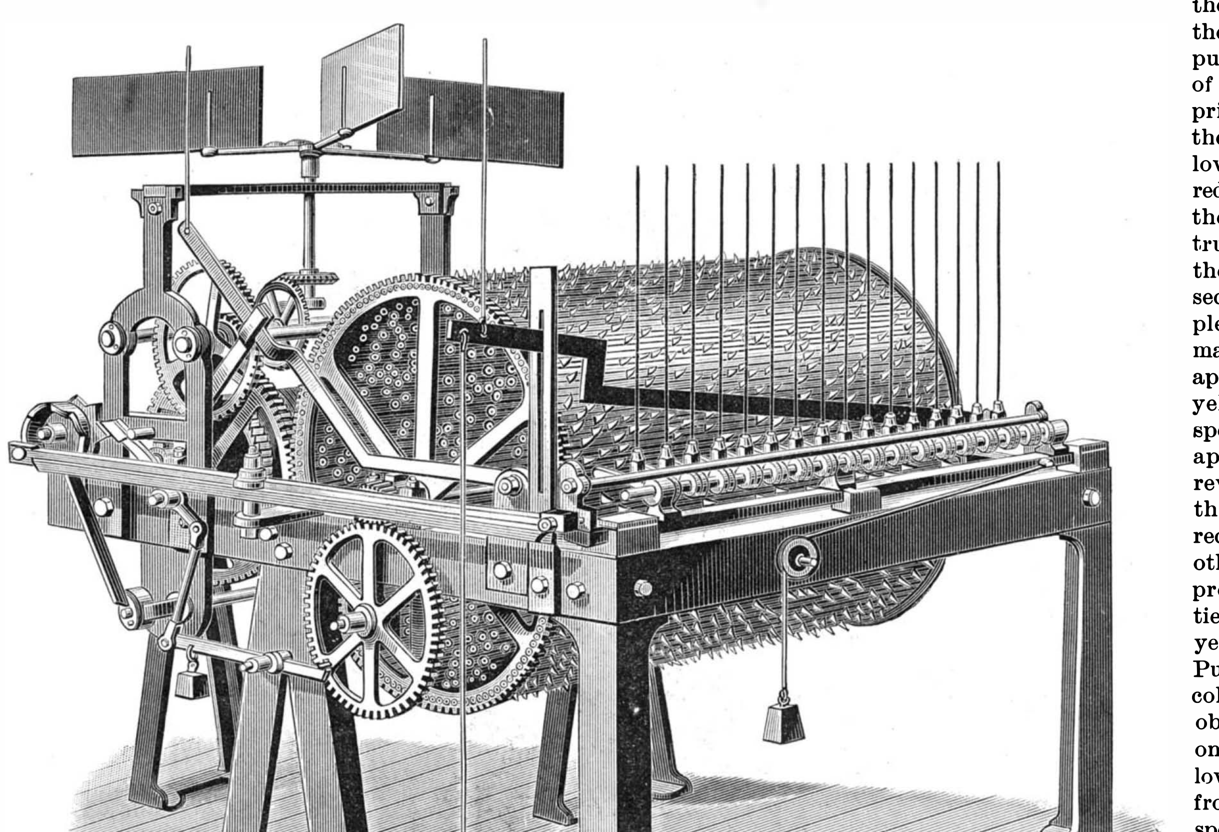
Of late years, says *Engineering*, there has been a revival of the ancient custom of using the church bells for musical airs. Not only are the beautiful chimes known as the Cambridge quarters substituted for the monotonous "ting-tang" on two bells, but when the clock has chimed the quarters and struck the hour, it discharges by means of a lever.

In the carillon here shown, by the revolution of the barrel—the motive power being a weight of 8 cwt. on a smaller barrel which gears directly into the great one—the hammers are raised and strike the bells in due order, according to the arrangement of the pins. The hammers are of a massive character, and the blows are delivered with sufficient force to bring out the full tones of the bells.

The machine has been constructed on the old form, but with modern improvements, and is comparatively simple in design, very solid in material, calculated to do its work without failure, and to last at least a century—advantages that do not belong to the more modern form, which is easily deranged, and as a matter of fact often fails.

The barrel is of gun metal, 3 feet in diameter, machine cut, the bars of steel nutted at each end and sufficiently open to allow the fixture of the steel pins, 800 in number, which are secured by a screw nut inside the barrel, so that they can be easily removed when required and adjusted for other tunes. There are two hammers for each of the eight bells, to provide for the immediate repetition of a note for which a single hammer would be inadequate.

The machine, which plays at intervals of three hours, is entirely automatic. On being discharged by the clock, the barrel makes one revolution, the time being regulated by three fans, as shown, plays the air through, and in some cases repeats it. The wheel is then locked and the performance ceases.



IMPROVED CARILLON.

At the end of the day the hammers are moved for the next air. The object of making the change every day of the week, instead of after every tune, is to provide a special piece for each day, so that a sacred subject will always be played on Sunday. The tunes are as follows: Sunday, Ps. Quam dilecta, from Hymn A. and M., 242; Monday, Auld Lang Syne; Tuesday, Hanover; Wednesday, Home, Sweet Home; Thursday, Spanish Chant; Friday, Mozart's 12th Mass, Air from Last Movement; Saturday, Evening Hymn, Abide with Me.

As a fine specimen of work, the carillon, which, with the exception of the cast iron frame, is entirely constructed of steel and gun metal, is worth inspection. It has been constructed by Mr. Benson, of Ludgate Hill, London.

Life Failures.

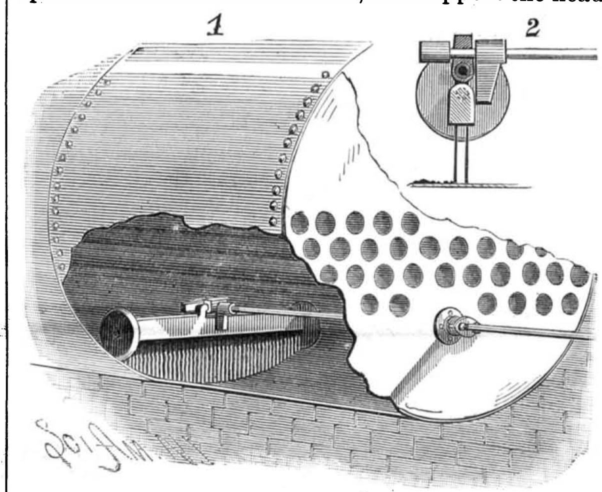
An expert compiler of statistics in England has received a commission from a literary client to collect information regarding causes of individual failures in life. The compiler, accordingly, has issued a circular which he has mailed "to all curates of more than forty and journalists over thirty-five years of age; to all unknown barristers, and to certain members of Parliament, and public men." It is a cruel document, as its mere receipt shows that the person to whom it is addressed is regarded as a patent failure. The form of inquiry reads as follows:

"To what causes do you attribute your failure in life? I, ———, of ———, profession ———, attribute my failure in life to the following causes: 1. Drink (say what drink). 2. Gambling (turf, cards, or what). 3. Dishonesty. 4. Unfortunate acquaintances. 5. Marriage. 6. Single life. 7. Disinclination to work. 8. Lending or borrowing (say which). 9. Unpopular views (political); unpopular views (religious). 10. Tobacco (in what form). 11. General incapacity. 12. Other causes. General remarks."

It is not easy to conjecture what would be the mental sensations of a recipient of the above, after he had once recovered from the primary embarrassment of discovering that the shot was aimed at himself; nor is it in all respects easily answered. For a broken-down toper to determine what particular drink had been his rock ahead in life would perhaps be a difficult task. In fact, in the circumstantiality of the suggested answers lies the ingenious barb of the document. Still, while a man might naturally be diffident about proclaiming his own relationship to any of the above enumerated causes of his life failure—if, indeed, he could be brought to concede the latter to be a fact—there is little doubt that he could find a fitness in the formula for many of his acquaintances. It is not improbable, adds the *American Analyst*, that the English "literary" gentleman who originated this scheme—in the light of which the American newspaper interviewing system fades into a faint shadow—will, in the end, be obliged to content himself with some series of substituted confessions such as we have suggested.

BOILER CLEANER.

Placed near the lower side of either the front or rear of the boiler is a packing box, through which passes a long iron or steel rod, on whose inner end is loosely mounted a block, hinged to which is a brush head provided with wire splints. Upon each end of the brush head is a small wheel; these wheels run upon the bottom of the boiler, and support the head



MILLAR'S BOILER CLEANER.

in a horizontal position. Rigidly secured to the rod, upon either side of the block, are lugs placed at right angles to each other, so that when one lug is turned to a vertical position, the other will be horizontal. One lug is for the purpose of driving the brush along the bottom of the boiler toward the blow-off, while the other is for pulling the brush toward the front of the boiler. The small sectional view clearly shows the arrangement of these lugs. If the brush is to be pulled forward without carrying the mud with it, the rear lug is turned up, when the brush will swing backward and be dragged along the bottom of the boiler. By properly turning the rod and its lugs, the brush may be made to move to the accumulated dirt or mud toward the blow-off, which may be placed at any desired point in the bottom. By means of this device the boiler may be kept thoroughly clean, even when it contains its usual supply of water, or is under steam pressure, or empty.

Further particulars regarding this invention may be had from Mr. John Millar, Box 75, Allenford, Ontario, Canada.

Analysis of Color.

M. Camille Koechlin finds that the solar spectrum yields only two simple colors, blue and yellow. The third is blended with yellow and blue to constitute the reds on the one hand, the violet on the other, purple being red deprived of yellow, or violet deprived of blue, or simply the spectrum without yellow or blue. If on the red of one be projected the blue of another spectrum or on the violet of the first the yellow of the second, the result is purple. The red or the violet may again be restored by applying to the purple the yellow or blue of a third spectrum. And if these applications be made with reversed prisms, so that the complementary colors reciprocally cover each other, the spectrum will present at both extremities a purple region with yellowish white interval. Purple, being a simple color, will thus never be obtained by mixture, but only by extracting the yellow from a red or the blue from a violet. The solar spectrum contains the elements of all shades, either by mixtures or by diluting with white or extinction with black. In the latter case the colors containing blue preserve their tint, while those on the opposite side of the yellow become changed in character. Thus green, blue, and violet yield the so-called deep greens, blues, and violets, while the yellow, orange, red, and purple cannot be intensified, but pass over to olive, brown, garnet, or amaranth.

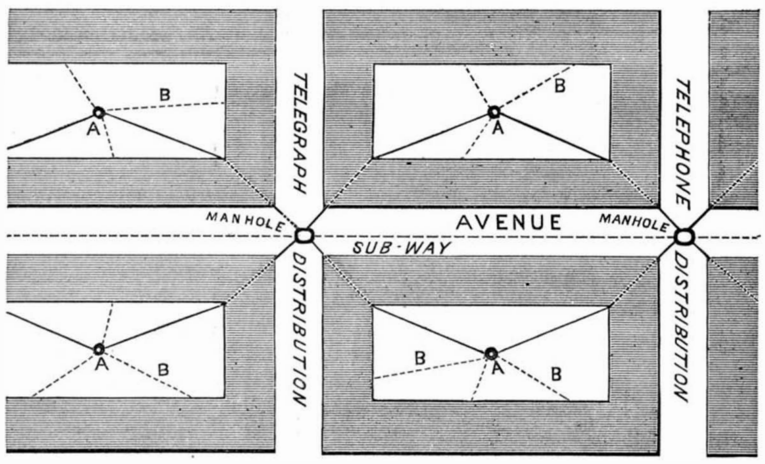
THE Midland Railway of England is making experiments with steel sleepers.

THE ELECTRIC SUBWAY CONDUIT IN NEW YORK.

(*Continued from first page.*)

blows produced, until the sound shows that the mass is compact. Then more mixture is introduced, and more ramming given it, until the mould is filled. Owing to the ramming, it is very hard and compact. The mould and block, after being cooled by the application of water from a hose, is swung away and cooled completely in a tank of water, the outer casing is removed, and a finished block is the result. They are inspected by the commissioners' inspector, and, if approved, are stenciled.

Besides the blocks, short paper tubes, that fit into enlargements in the ends of the apertures, are supplied. They are used to complete the conduit at the joints. They are dipped into melted pitch before delivery. Their use is shown most distinctly in the longitudinal



A, Central Distributing Point. B, Distributing Lines.

PLAN OF DISTRIBUTION.

section of the conduit, where also the enlarged ends of the holes can also be seen.

The conduit is laid in sections, every one of which is one block in length. Each section must be rigorously aligned, both as regards the vertical and horizontal planes. The grade must be perfectly uniform and true for this distance. It may vary from block to block, as may also the level. A trench is opened, and on its bottom a six inch bed of concrete is laid. This is made to conform accurately to the level or grade of the section, and by theodolite a straight line is drawn along its center. After it is sufficiently hard, the blocks are laid upon it in two longitudinal rows, breaking joints with each other. They are kept accurately in line, and are spaced apart by a template. Each block is laid thus: It is lowered into the trench, and placed in position about one inch from the preceding one. A hot plate of iron is held between the end faces of the two blocks until the ends are thoroughly hot. The paper tubes are next put into their seats, and long wooden mandrels are pushed through them and into the next block from the open end of the block that is being laid. The two segments are then pushed together until the paper tubes are seated. This brings them within an inch of each other, which interval is spanned by the twelve tubes and mandrels within them. Side or cheek pieces of iron are clamped on each side of the joint, and hot asphalt mixture is introduced, and worked in around the interstices by hot iron bars. The mandrels are withdrawn, and when the whole is perfectly filled and smoothed off, it is left to cool, the clamps not being removed for some time. When all is cold, the clamps are removed, and the longitudinal interval between the rows is filled with cement mortar, and a course of brick is laid over and around the two lines. Each block contains twelve holes, in three rows. In some sections the blocks are placed on their narrow edge; in others they are laid flat.

At each cross street is a large bricked manhole, in which one section ends and the next one commences. A double iron cover, one protective and the other arranged to lock fast, secure it when not in use. The cables are to be laid by means of these openings, being fed through by a machine, after they are started. The entire length of the openings, for a block at a time, is previously to be well oiled to reduce friction.

The impediments in the way of the engineers have been very great. Three separate gas companies have a number of mains lying in close proximity to the trench. The water mains and sewer culverts also impede operation greatly.

This much refers to the New York system. In Brooklyn the same material is employed, but the blocks have ten apertures only, of less diameter than in the New York conduit, and each block is provided with a bell or hub. These are laid like water or gas pipes, the paper tubes being dispensed with.

This much disposes of the question of the disposal of transit lines. The next problem is that of distribution to different houses and offices. The proposed method is shown in the accompanying plan. Each second manhole is to be devoted to the distribution of telephone lines, and the alternate ones to telegraph line connections. A main branch is to be carried from the manhole to the interior of each block of houses. As near the center as may be is to be established either a single pole or a manhole. From this point individual lines are to be carried under or over ground to the different houses requiring them.

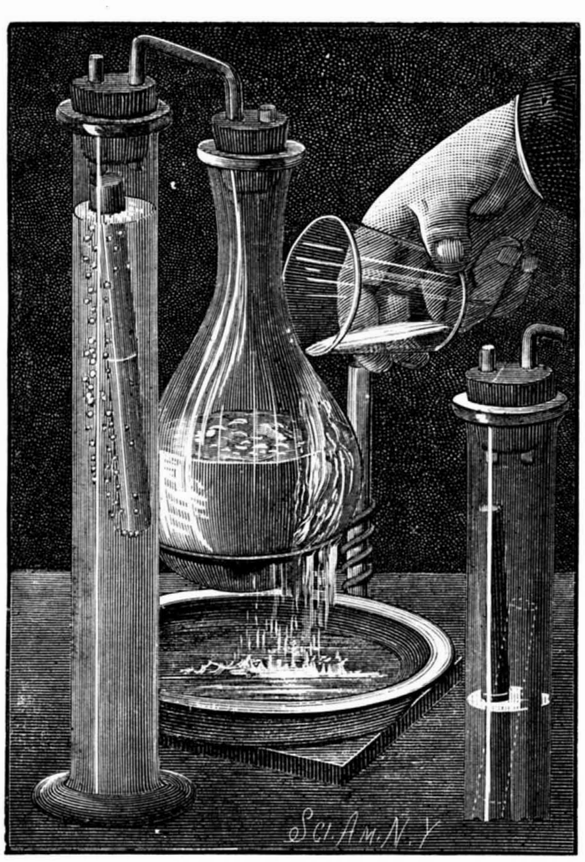
Such is the system now being introduced. Its principal characteristic is the absence of metal. Even the short joint tubes are of paper. While cheapness of construction is thus consulted, many good effects of metal are lost. The interior of the holes can hardly be as smooth as a good metallic pipe, and they will be more subject to deformation. A slow change of shape, such as sealing wax often will undergo, is among the possibilities. This, it is assumed, will be prevented by the large proportion of sand that is worked into the mixture. The anti-inductive effect of metal is lost. This will be provided for in each individual cable, it is to be presumed, in its lead casing. The objection made to metal pipes that they will decay cannot be regarded as well founded. A good cast iron pipe will last for a number of years as yet undetermined.

EXPERIMENTS IN PNEUMATICS WITH A STEAM VACUUM.

T. O'CONOR SLOANE, PH.D.

We have already shown how several representative air pump experiments can be performed with steam vacua. The interest attaching to this method of working in pneumatics is not confined to the mere simplification of apparatus, but each experiment serves still further to show how steam is really an invisible gas, returning to the liquid state on reduction of temperature. In engineering, this method of producing vacua sometimes operates disastrously. Boilers on vessels that have sunk suddenly have been known to collapse under its effects. Where a large space is to be exhausted, this method can often be adopted. In creosoting wood, the logs are run into large cylinders and treated with steam. If the steam is allowed to condense, a vacuum is formed, and any air contained in the pores of the wood is expelled. Then, on admitting the creosoting solution, it is eagerly imbibed by the wood, the capillary action being seconded by the atmospheric pressure. The experiment shown in the cut is an illustration of such a process. In practice on the industrial scale air pumps are often employed, but it is quite possible to dispense with them.

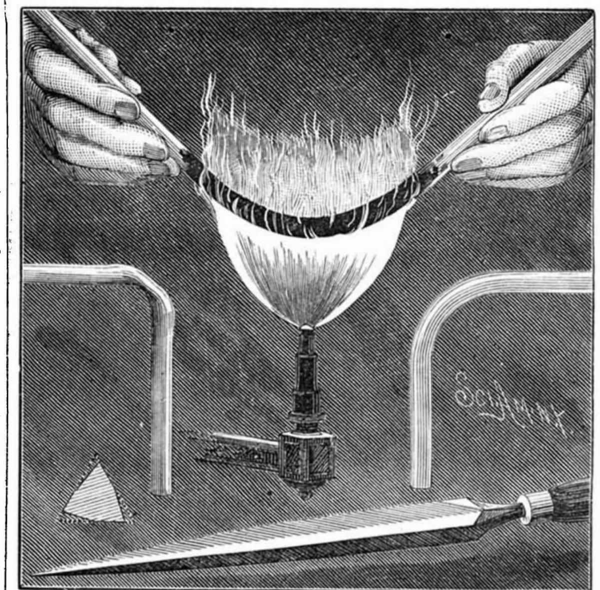
The boiling flask is arranged in connection with a tall vessel. Any bottle will answer, but such a cylinder as shown is convenient. A piece of wood is floated in it when it is partially filled with water, and the line to which it sinks is marked upon it. The cylinder is then filled as full as possible, corked, and the steam



AIR IN PORES OF WOOD.

vacuum produced as before described. After the flask has boiled some minutes and the plug has been replaced, it may be cooled by having water poured over it as shown. The air contained in the pores of the wood immediately begins to expand, and escapes in innumerable bubbles. This continues for a long time. The amount that can be thus withdrawn seems to have no limit. It must be remembered in this connection that the bubbles afford no real measurement of the air given off, referred to ordinary conditions, as the low pressure expands the air to ten or fifteen times its volume. If we imagine, therefore, that fifteen of the bubbles are compressed into one, we shall have some idea of the actual volume of air expelled, if measured at atmospheric temperatures.

After five or ten minutes have elapsed the plug may be withdrawn, when the sudden cessation of the effervescence and the shrinking out of sight of the bubbles will be quite striking. The cylinder is uncorked, some



MANIPULATION OF GLASS TUBES.

of the water poured out, and the floating of the stick is observed. It will be found to sink deeper in the water, perhaps half an inch below the original line. This is shown to one side of the cut, the stick as it floats after the process being indicated by dotted lines.

In performing a series of these experiments, it will be found very tiresome to hold the flask over the lamp. An extemporized ring stand is shown that will save this labor. A piece of strong wire is bent at one end into a ring of size adapted to receive the flask, and at the other end it is wound into an even spiral. A piece of board, about six inches square, has a hole bored in one of its corners or near the center of one of its sides. This receives an upright piece that the spiral fits closely around. By pushing the wire up or down on the upright standard the level can be adjusted. Even if the spiral fits loosely, the weight of the flask will tend to make it bind upon the upright rod. The best plan would be, after its level is adjusted, to secure it by a tack. The mode of connection by a bent tube with no rubber joints is far the best to use in these experiments.

A word on the manipulation of glass tubing will not be out of place here. To cut it into short pieces, a file is as good as anything. Glass knives, made of Wootz steel, are also very efficient. These are so brittle that the edge keeps flaking off, thus keeping always in cutting condition. To cut a tube, a small scratch is given it across one side at right angles to its axis. No deep notch is required. Then it is taken in the hands, one on each side of the scratch, with the thumbs underneath the glass, and about an inch from each other. Both hands are now drawn apart, and at the same time a slight bending stress produced, the ends of the tube being drawn against the thumbs and toward the body. The tube thus treated breaks off square where the file has scratched it. The point is not to attempt to break the tube as if it were a piece of wood, but to combine a strong pull with a slight transverse strain.

By the file, or by holding the end in an alcohol lamp flame, the sharp cutting edge can be removed.

A file soon becomes dull when thus used, but it can, by sharpening, be made to last a long time. The sharpening is done on a grindstone on each edge on one side only. Thus each corner is smooth on one side and has file cuts on the other. The process is illustrated in the cut, a file that has been thus treated being shown in section and in general view.

A convenient way of bending tubes is also shown. The tube is held in an ordinary gas flame, near its upper part, its length coinciding with the long axis of the flame. The tube is continually rotated. The flame soon coats it with lamp black. After a few minutes it begins to soften. As soon as it yields easily it can be slowly bent as desired, without being removed from the flame, the outer and inner sides of the bend being alternately exposed to the flame. On the right of the cut a good bend is shown, on the left a bad one, such as should be always rejected.

In pushing glass tubes through corks, care must be exercised to avoid injury. The pressure should always bear upon a straight part of the tube. If any force is required, the tube should be surrounded by a towel. Sometimes the hand is badly injured by tubes breaking and lacerating it while being pushed through corks.

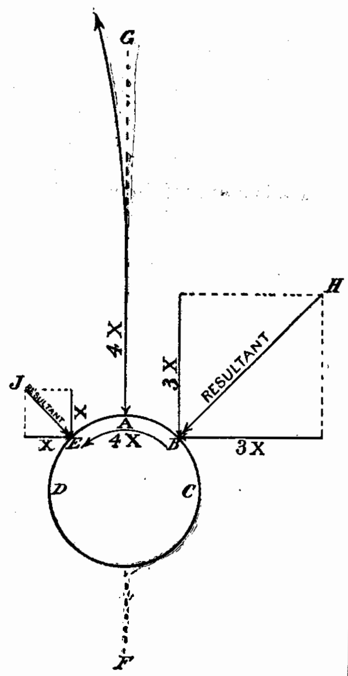
Correspondence.

THE ART OF PITCHING IN BASEBALL.

To the Editor of the Scientific American:

In the number of your paper for July 31 you publish quite a long article on curve pitching, which I read with much interest.

Upon one point, however, I think the author has been misinformed, viz., that the ball curves *toward* the side on which it meets the greater resistance. The accompanying sketch will show my theory of the art of curve pitching, and the one, I believe, most generally accepted.



Let a ball be moving from F to G with a velocity such that the resistance of the air at A will be represented by the line, 4 *x*.

At the same time let the ball be revolving on its own axis, from right to left, at the *same* rate, viz., so that the resistance of the air to its revolution, at any point on its circumference, shall be represented by the curved line, 4 *x*. Then the resistance of the air to the motion of the ball from F toward G will be expressed as follows:

At A, resistance $= 4x$.
" C, " $= 4x + 4x = 8x$.
" D, " $= 4x - 4x = 0$, etc.

Taking intermediate points, for example, at 45° either side the center line, F G, we can assume for such points that the resistance of the air will be:

At B, $4x + 2x = 6x$, and
" E, $4x - 2x = 2x$.

Owing to the angle at which the ball meets the air at these points, the resistance must be considered as the resultant of two forces, as shown in sketch by the lines marked $3x$, $3x$, and x x.

Hence we find that the ball is acted upon by the two resultants, H B and J E. Under the combined action of these two unequal resistances, the ball will take some direction *away* from the greater resistance, and will curve to the left.

This is called the *out* curve, and the *in* curve is exactly the reverse in its action.

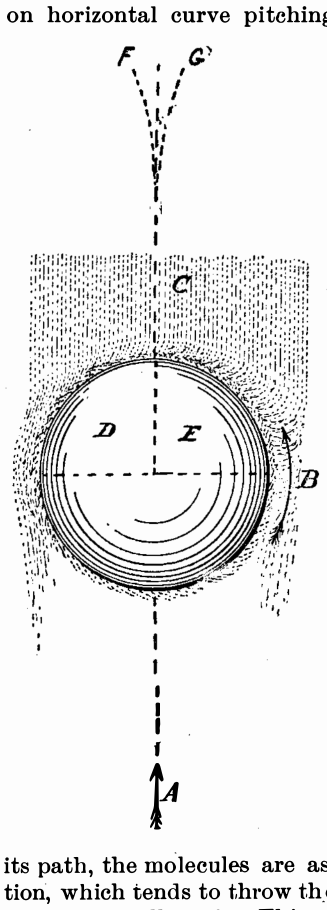
This theory of the action of the air is supported by the results of practice and experiments.

G. G. TOWNSEND.

Cumberland, Md.

To the Editor of the Scientific American:

I read with interest the article by Henry Chadwick on horizontal curve pitching in baseball, which appeared in your issue of July 31.



The real philosophy of the horizontal curve is as follows:

In the subjoined diagram, arrow A indicates the direction of the ball's trajectory after receiving its initial propulsion from the pitcher. Arrow B indicates the direction of its rotation (right to left) on its perpendicular axis, imparted to it also by the pitcher. The atmosphere, C, through which the ball moves with a velocity of, say, 100 feet per second, offers resistance to its forward hemisphere amounting to several pounds to the square inch, its molecules being forced aside to the right and to the left to make room for the advancing ball. On the left quarter, D, in escaping from its path, the molecules are assisted by its rapid rotation, which tends to throw them in the direction they would naturally seek. This produces a thinning out, or what resembles a partial vacuum, when compared with the state of air existing on quarter E. Here the molecules are not only unassisted, but are actually retarded, by friction with the rotating ball, in their effort to escape by the only way possible—toward the curved arrow B; in consequence of which, a compression of the atmosphere occurs on this quarter.

I have shown that the ball is moving through a medium whose density is much greater at quarter E than at quarter D; the result is manifest. A curve is described toward F. The atmosphere at E, because of its greater density, acts on the ball as a cushion, from which it continually rebounds.

Give the ball an axial rotation in the opposite direction, and, governed by the same law, it will describe a curve toward G.

The SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 410 and 423, contains additional information on this theory.

K. E. E. MUNSON.

Millerton, N. Y.

Cause of the Charleston Earthquake.

To the Editor of the Scientific American:

In your issue of the 18th Sept. you publish a letter, over the signature Edward W. Byrn, which suggests a theory accounting for the Charleston earthquake.

Mr. Byrn takes the ground that "the escape of the vast volumes of petroleum and natural gas from the wells sunk into the bowels of the earth may furnish a cause for the earthquake in this region," and that these materials issuing from internal cavities release the superincumbent strata of rock, which, in consequence, falls, and the ensuing earth tremors are most severely felt along the line of weakness near the Atlantic coast.

In the first place, this theory takes for granted that either (1) these cavities have *always* been full of natural gas and petroleum at a fixed pressure, or else (2) that in their formation and storing, the earth's crust was lifted and cavities made, which were immediately filled and supported the rock, as on a cushion.

Now:

1. Almost, if not all, of the theories accounting for the presence of gas and petroleum accept the fact that these substances were formed subsequent to the final comparative quiescence of the earth's crust after ages of upheavals and disturbances. This being so, there must have been cavities for the reception of gas and petroleum before they were formed; and, if the overlying strata kept their position, then, when the cavities were empty, why should they now be disturbed by the withdrawal of the contents of the cavities?

The "enormous pressure" at which they are sometimes found is easily accounted for by the continued accumulation of the gas and oil in confined space, as the increase of pressure would by no means hinder the chemical combination of the materials of which they are formed.

2. That the pressure has raised the strata and made the cavities is highly improbable, to say the least. That a pressure of some hundred pounds should raise a mass of rock from 1 to 2,000 feet in thickness and indefinite surface is beyond possibility.

As a matter of fact, no disturbance in the gas and oil regions was noticed at the time of the earthquake, and up to the present time no increase or diminution of the supply has been reported from any part of these districts.

I think Mr. Byrn's theory is entirely untenable, unless we radically change our views of the formation and storing of gas and petroleum.

P. M. F.

Patentees Must Use or Allow Others to Use.

The commonly accepted doctrine of American patent law is that no person has the right to make, use, or sell a patented invention without the consent of the patentee; whoever does so is liable as an infringer, and the court, on due proceedings, will enjoin him from the use. But in the case of Hoe & Co., the well-known printing-press makers, against Knap, tried in the U. S. Court, northern district of Illinois, Judge Blodget declined to enforce the above doctrine, holding as follows:

The proof on the application for a preliminary injunction was to the effect that the complainant, the owner of this patent, had never used it, and never constructed a printing press with the Crowell device. The argument is that the owner of this patent was a very large manufacturer of printing presses; that they did not manufacture and keep printing presses in stock, but only made them to order; and that they have received no order as yet to make a press containing the Crowell device. The question, therefore, arises whether the court will grant an injunction in favor of the owner of a patent who has not, after a reasonable time, put it into use, against another who is using it. I think, under a patent which gives a patentee a monopoly, he is bound either to use the patent himself or allow others to use it on reasonable or equitable terms, and as I refused an injunction on the motion before the hearing, I shall refuse an injunction in the interlocutory degree, and allow the defendants to continue to use the patent on their giving bond as they have heretofore.

PHOTOGRAPHIC NOTES.

The Relative Rapidity of Emulsion Plates.—At a meeting of the London and Provincial Photographic Association on the 9th ultimo, we find reported in the *British Journal of Photography* the statement that gelatino-chloride plates are from 25,000 to 30,720 times slower than rapid bromide plates. The chloride plate was exposed twelve inches from a gas burner for eighty minutes, and the bromide at ninety-six inches distant for ten seconds. Mr. A. Mackie said he had tested collodio-bromide plates against ordinary bromide, and found them to be three hundred times slower.

Enameling Colored Photographs.—Mr. C. Brangwin Barnes in the *Photographic News* says: The picture which is to be subjected to the double process of coloring and enameling should be printed a shade lighter than one meant to be treated in the ordinary way and turned out plain. Care should be taken not to overtone it, a sepia gray being the tint calculated to produce the best results; and it should be untrimmed, a margin of at least half an inch all round being left. After fixing and washing, it should be pinned, while still damp, on to a drawing board, and when dry it is ready for the artist's hands. Ordinary moist or cake water colors may be used, but to minimize the chances of failure, we found the so-called albumen colors the best to use. The colors I refer to were introduced by M. Lambert some years since, for coloring chromotype photographs, and were sold on cards by the Autotype Company, from whom I believe they are still obtainable. Care should be taken not to put the tints on too high, as enameling serves to intensify them, and carmine should be used very sparingly, not only because the color is fleeting, but because it has a tendency to run into spots, and give a rough appearance to the finished picture. The print being colored and ready for enameling, a sheet of glass (preferably plate glass) is prepared in the usual manner—that is, either with a solution of yellow wax in benzole, or with powdered talc. I personally prefer the first mentioned, as the print usually comes off cleaner and more easily. A few drops of the solution are poured on the glass, which should be perfectly clean and free from scratches or flaws, and gently rubbed over the entire surface with a piece of clean flannel until it begins to set. It is then polished off with another piece of the same material until it appears clean, and polished again. To test if enough wax remains, the tip of the finger should be pushed along the surface, near the edge, when, if properly prepared, it will meet with a considerable resistance and produce a grating noise. It is then coated with enamel collodion in the same manner that a plate used to be coated for the wet process, or that a negative is varnished, and care taken that the collodion be not allowed to run into crapey lines.

Immediately the collodion sets (not dries) it is immersed in a dish of cold water until all greasiness disappears. The colored print should then be carefully collodionized in the same manner as the plate, and when the film is thoroughly set it should be passed through a solution of gelatine in hot water, then laid upon the plate and carefully squeegeed until all air bubbles disappear, which may easily be seen from the back of the glass. It is then put aside under pressure for an hour, when it is ready for mounting—or, rather, for a sheet of thin cardboard to be attached to the back by the aid of thin Russian glue, gelatine having a tendency to reduce the gloss of the finished result. It is then again placed under pressure for about an hour, and then set up to dry in a cool place. When thoroughly dry, the blade of a knife may be placed under the edges, and the picture will come off perfectly flat, and with a high enamel surface; and if the operations have been carefully performed, the coloring will be found as clear and perfect as when first done. It now only requires trimming and affixing to the final mount, which is best done by the aid of coaguline, applied to the edges only.

This may appear, at first sight, a very tedious and difficult process, but after one or two pictures have been enameled, it will become quite easy to manage.

Fast Ironclads.

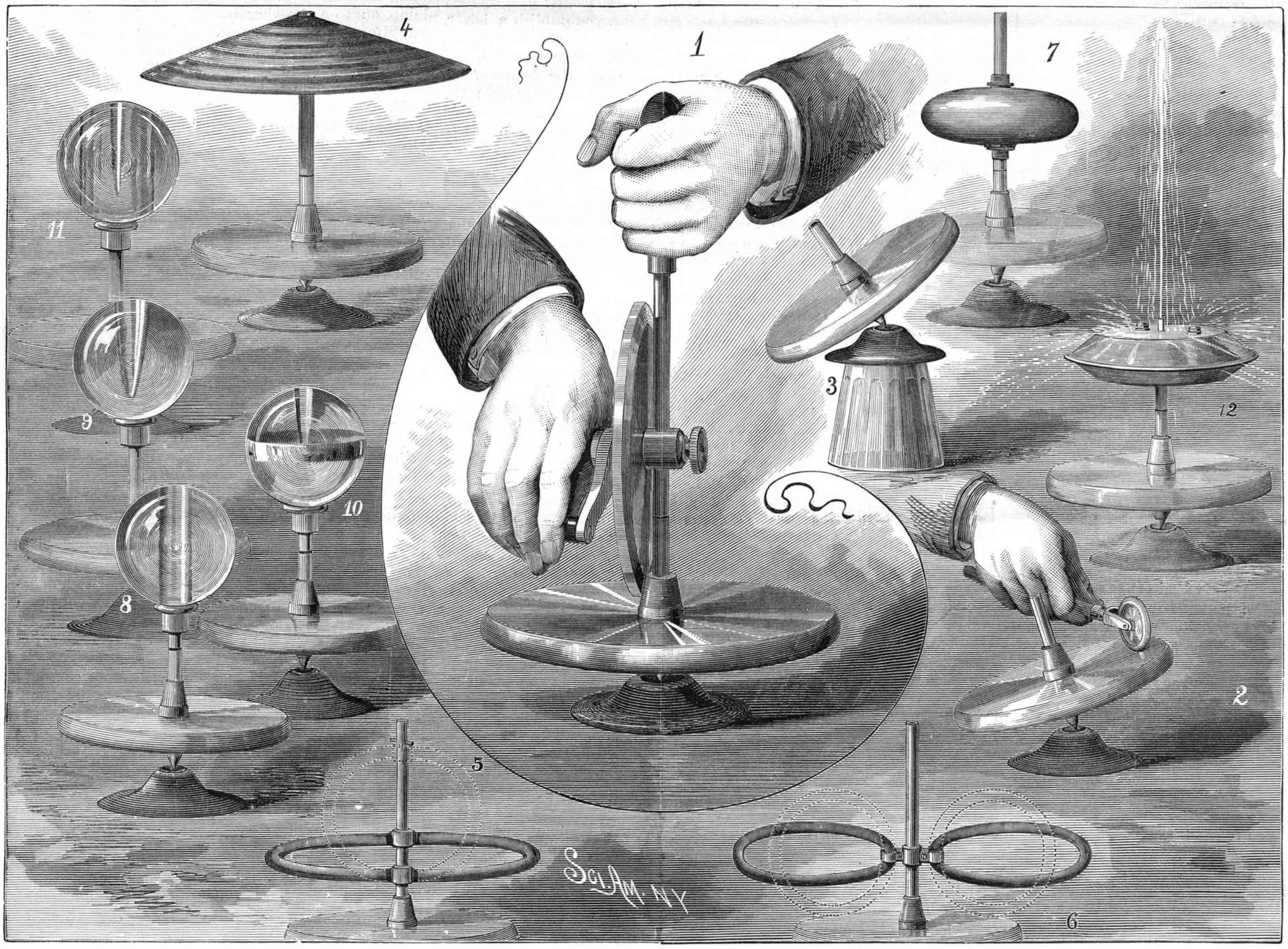
An official paper issued at Rome gives the following particulars regarding the fastest ironclads in the world: Italia (Italian), 18 knots an hour; Lepanto, Umberto, Sicilia, and Sardegna (Italian), 17·50; Warspite (English), 17·20; Imperieuse (French), 17; Ruggiero di Luaria, Morosini, and Andrea Doria (Italian), 16·50; Nile, Trafalgar, Sanspareil, Anson, Camperdown, Benbow, Rodney, Howe, Collingwood, Colossus, and Edinburgh (English), 16; Duilio (Italian), 15·50; Dandolo (Italian), 15·20; Devastation (French) 15·17; Alexandra (English), 15; Foudroyant, Admiral Baudin, Formidable, Neptune, Hoche, Marceaux, and Magenta (French), 15; Hercules (English), 14·69; Redoubtable (French), 14·66; Temeraire (French), 14·65; Dreadnought (English), 14·52; Affondatore (Italian), 14·50; Terrible, Indomptable, Caiman, and Requin (French), 14·50; Admiral Duperre (French), 14·47; Sultan (English), 14·30; Neptune (English), 14·20; Inflexible (English), 14; and Vauban (French), 14.

A SCIENTIFIC TOP.

BY GEO. M. HOPKINS.

Every street urchin can spin a top, and get an unending amount of amusement out of it; but it would seriously puzzle the majority of "boys of older growth" to satisfactorily explain all the phenomena of this simplest of toys.

Why does it continue to revolve after being set in motion? Why does its motion ever cease? Why does it so persistently maintain its plane of rotation? When its axis is inclined to the vertical, why does it revolve slowly around a new axis while turning rapidly upon its own axis? And when so inclined, why does it gradually right itself until it rotates in a horizontal plane? Why does it not revolve proportionately longer when its speed is increased? These and many other questions arise when we begin the examination of the action of the top. They have all been answered so far as it is possible to answer them, still it is difficult to reach far beyond the mere knowledge of the actions themselves.



1. The Top. 2. Persistence in Maintaining Plane of Rotation. 3. Gyroscopic Action. 4, 5, 6. Examples of Centrifugal Action. 7. Formation of Oblate Spheroid. 8, 9, 10, 11. Examples of Centrifugal Action on Liquids. 12. Centrifugal Hero's Fountain.

A SCIENTIFIC TOP.

The top has already risen to some importance as a scientific toy, but it is worthy of being raised to the dignity of a truly scientific instrument. To give it that eminence, three things are necessary: first, a considerable weight, and in consequence of this, an easy and effective method of spinning, and finally, it requires a good bearing, having a minimum of friction.

The top illustrated has these three requisites. It weighs 3½ pounds, and its weight might be increased somewhat with advantage. It has a frictional spinning device by which a velocity of 3,000 revolutions per minute may readily be attained. It is provided with a hardened steel pivot which turns on an agate step.* It is almost perfectly balanced, and the friction of its bearing is very slight. When unencumbered, it will run for over 42 minutes in the open air with once spinning, and its motion may, at any time, be accelerated without stopping, by a new application of the friction wheel.

The brass body of the top is 6 inches in diameter, and ⅝ inch thick in the rim. Its steel spindle is ⅜ inch in diameter, and has a tapering longitudinal hole which is ¼ inch in diameter at its larger end. To this tapering hole is fitted the tapered end of a rod supporting the stud on which the friction driving wheel turns. The upper end of the rod is provided with a handle, and to the boss of the friction wheel is secured a crank.

A sleeve fixed to the spindle of the top is furnished with an elastic rubber covering which is engaged by the beveled surface of the driving wheel. After imparting the desired speed to the top, by turning the driving wheel, the wheel and the rod by which it is supported may be withdrawn from the top, without interfering in any way with its action.

A large number of interesting experiments may be performed by means of a top of this character. Most demonstrations possible with the whirling table may be adapted to this top, and, besides, many phenomena peculiar to the top itself may be exhibited. A few of the more striking experiments are illustrated.

By suddenly pressing upon one side of the top with a small rubber-covered wheel, as shown in Fig. 2, it will be found impossible to change its plane of rotation by the application of any ordinary amount of force. In fact, the side of the top to which the pressure is applied will rise rather than yield to the pressure.

By placing the step of the top on an elevated support, such as a tumbler (as shown in Fig. 3), and gently pressing against one side of the spindle, the axis of the top will be gradually inclined, and a gyroscopic action will be set up. The top will swing around with a very slow, majestic movement, traveling six or eight turns per minute around a vertical axis while revolving rapidly on its own axis, and it will slowly regain its original position.

As the peripheral speed of the top is almost a mile a minute, a little caution is necessary in handling it while in rapid motion, as any treatment that will cause it to leave its bearings will be sure to result in havoc among the surroundings, besides being liable to injure the operator.

Several methods of showing centrifugal action are illustrated, the simplest being that shown in Fig. 4. A small Japanese umbrella, about 20 inches in diameter, is arranged to be rotated by the top, by applying to its staff a tube which fits over the spindle of the top. In this, as well as the other experiments, the top is set in motion before the object to be revolved is applied. The tube attached to the umbrella having been placed on the revolving spindle, the arms are thrown up by centrifugal action, thus spreading the umbrella.

Fig. 5 shows a ring formed of two pieces of heavy rubber tubing secured to two metallic sleeves fitted to a rod adapted to the tapering hole of the top spindle. The lower sleeve is fixed, and the upper one is free to slide up or down on the rod. Normally, the rubber forms a ring, as shown in dotted lines, but, when rotated, the centrifugal force reduces it to a flat ellipse. A similar experiment, in which two elastic rings are secured on opposite sides of the rod, is shown in Fig. 6; the rings being circular when stationary, and elliptical when revolved.

In Fig. 7 is shown a device for illustrating the formation of an oblate spheroid. A tube, closed at the lower end and fitted to the hole in the top spindle, is provided near its lower end with a fixed collar and a screw collar, between which the lower wall of a hollow flexible rubber sphere is clamped. The upper wall of the sphere is clamped in a similar way between collars on a sleeve arranged to slide on the tube. The tube is perforated above the lower pair of collars to admit of filling the hollow ball with water. When the ball is filled or partly filled with water, and rotated, it becomes flattened at the poles and increases in diameter at the equator, perfectly illustrating the manner in which the earth received its present form.

The glass water globe represented in motion in Fig. 8 exhibits a cylindrical air space extending through it parallel with the axis of rotation, the water having been carried as far as possible from the center of rotation by centrifugal action.

When the speed of the globe is reduced, gravity asserts itself, and the air space assumes a parabolic form, as shown in Fig. 9.

In the globe represented in Fig. 10, the filling consists of water and mercury. The rotation of the globe causes the mercury to arrange itself in the form of a narrow band at the equator of the globe.

Fig. 11 shows a globe filled with air, oil, and water, which, when the globe is revolved, arrange themselves in the order named, beginning at the center of the globe.

A Hero's fountain, operated by centrifugal force instead of gravitation, is shown in Fig. 12. The metallic vessel contains three concentric compartments. The jet tube extends downward into the central compart-

* An agate mortar of the smallest size, about 1¼ inches in diameter, mounted in a wooden base, forms the step.

ment and is bent laterally, so that it nearly touches the wall of the compartment. The intermediate compartment communicates with the outer compartment, and the outer and central compartments are connected by an air duct. The central and intermediate compartments are filled with water, and as the vessel is revolved the water in the intermediate compartment is carried by centrifugal action into the outer compartment, and, compressing the air contained in that compartment, drives it through the air duct, with a force due to the centrifugal action, into the central com[illegible]rtment, where it exerts a pressure on the water suf[illegible]nt to cause it to be discharged through the jet.

[illegible] adaptations of the top will be described later.

[illegible]ARFUL RAILWAY COLLISION.

[illegible] of September an accident of the most [illegible]e took place at Silver Creek, N. Y., on th[illegible], Chicago & St. Louis Railway.

Th[illegible]ra Falls excursion train, which left Ashtabula, O., at 8 A. M., stopped at all the stations to Silver Creek, and left there on time with the eleven passenger coaches well filled with Ohio, Erie, and Dunkirk people. There was a baggage car ahead and next to it was the smoker, half filled with men. Three-quarters of a mile east of Silver Creek, just as the train was leaving a big trestle to round a curve, engineer Lewis Brewer was horrified to see the engine of a freight train plunging toward him on the same track at a high rate of speed. Brewer whistled, put on the air brakes, and reversed his engine. Then he and his fireman jumped. The freight engineer whistled and jumped just as the engines came together with a terrible crash. The baggage car was instantly telescoped into the smoking car, but the other cars were not badly hurt. A moment after the crash the air was filled with the groans of the dying and the hiss of the escaping steam.

The engines were almost demolished, and the baggage car was found to have plowed to within five feet of the rear of the smoker. Great difficulty was experienced in working at the wreck, which was almost literally covered with blood. The scene was too sickening to be described, and many of the passengers who tried to help the railroaders were overcome with faintness. Body after body was taken out, until the bodies of fourteen dead persons were placed on the ground near the wreck. Some of the bodies were so horribly mangled that identification was uncertain.

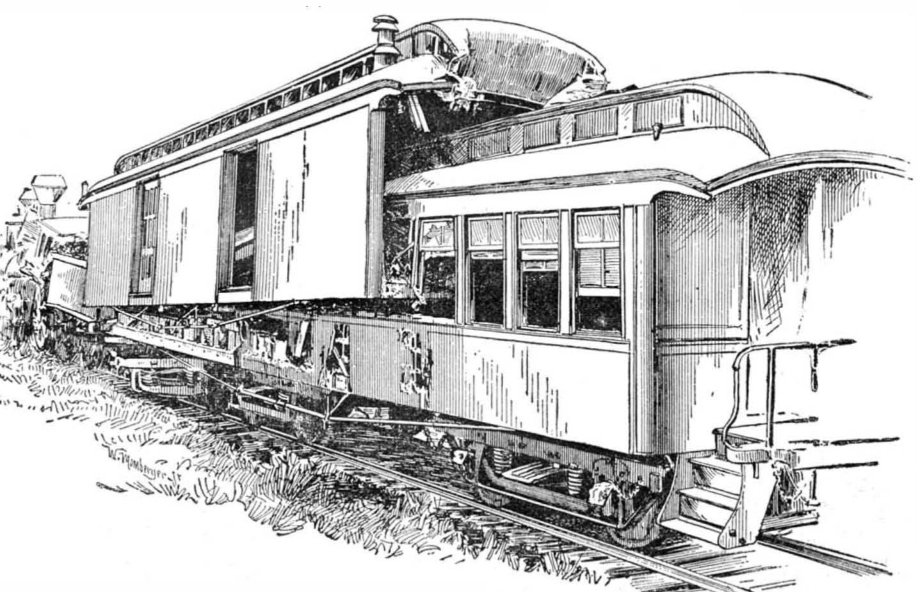


Fig. 2.—THE TELESCOPED CARS—WEST VIEW.

Many persons were badly injured; of these about eighteen have died, making the number of deaths about thirty-five.

The accident was due to disobedience of orders on the part of those in charge of the freight train. Instead of remaining at the siding directed, they attempted to proceed to the next siding ahead. Charles McSparren, of Erie, was one of the four passengers in the wrecked smoking car who escaped alive. His hands were lacerated with broken glass, his clothes were torn and spattered with blood. He said:

"You have no idea of the horrors of those few seconds. We had left Silver Creek, and were going along at a good rate of speed, when suddenly the train gave a lurch and the next instant there was a crash which sounded like an explosion. Then, for three or four seconds, the baggage car tore right through our coach as it telescoped us. The car was half full, and most of those ahead of me (I was on one of the rear seats) were crushed to death almost before they knew it. So sudden was it that there was not a chance to save themselves, or try to do it. The man in the seat ahead of me was killed, and the shock slung me around with his body. I was pitched out into the sand somehow, and when I came to I suppose the sight made me intensely sick."

The *Railroad Gazette*, from which we take the accompanying illustrations, says: The engravings will make very clear to railroad men its nature and probable cause. It will be remembered that in the telegraphic reports of the accident it was stated that "the drawbar of the baggage car was higher than that of the smoking car." Whether this was so or not does not appear in the engravings, and we have no other evidence of it, but it will be seen that the "circumstantial evidence" that it was so is painfully strong. The collision, regarded simply as a collision, was a decidedly mild one. On the engines, one cylinder and a part of the steam chest of one engine was knocked off and the cylinder head of the other engine, but the coll sion was not violent enough to do any injury to the boilers, thus saving the horrible addition to the death roll from escaping steam which has so frequently resulted in such accidents. The manner in which the cab and tank are fractured likewise indicates no very extraordinary violence.

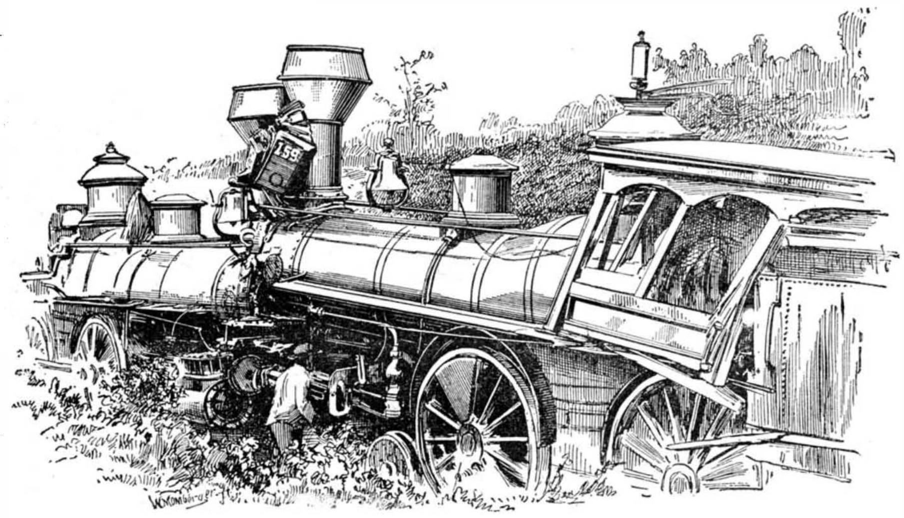


Fig. 1.—THE ENGINES.

We may be quite certain that with a train of well built Pullmans, provided with approved coupler buffers, there would have been no telescoping from any such force as this.

Even with ordinary passenger and baggage cars, there would probably have been some broken sills and perhaps a general smash up in one end of some car, but hardly such a fearful case of telescoping as the two views of the cars show.

It seems evident that the baggage car mounted at once above the coupling and platform of the smoking car, gave a square blow against the end of the car, and in smashing it in was given a quick slant upward to the level of the windows.

There it encountered the line of least resistance, and went on in a nearly horizontal line, cutting through the windows on one side and the roof on the other until the force of the blow was spent.

When we consider that the smoking car was crowded full of passengers at the time, the awful scene of death within can be only too well pictured. According to the latest reports, out of 40 in the car, 14 were killed, 19 injured, and 7 escaped uninjured. One cannot help wondering that so clean a cut, with so little general fracture, should have been possible both on the sides and roof, but probably the strongest car would shear almost as easily, granting the provoking cause to start the telescoping. It is in that that the moral of the occurrence lies from a mechanical point of view.

Cement in Ireland.

Henri Sainte Claire Deville, the illustrious French chemist, in the course of certain recent researches, discovered that some compounds of hydrate of lime and hydrate of magnesia afford a cement of eminently hydraulic properties, and setting rapidly under water. He further found that the natural dolomites, which consist of carbonate of lime and carbonate of magnesia, in proportions either of one atom of each or of two or three atoms of the lime carbonate to one of magnesia, if calcined at a very low red heat and ground to powder, produce, without any other treatment, a fast-setting hydraulic cement, which becomes so hard that it may be employed also as an artificial stone, which, for architectural purposes, retains the fine warm tint of color of the dolomite in its natural state. Now, in many parts of Ireland dolomite is abundant as a quarry rock. It can be obtained of a fine creamy white color, and very free from iron and manganese, which would in the preparation darken its color as a cement. The amount of heat required for its calcination is very slight, and may with great advantage and cheapness be communicated in furnaces heated by gas evolved by the imperfect combustion of peat, employing a modification of Charles Siemens' regenerative furnace. The calcined stone can be ground by water power, and the casks for packing the cement may be a subsidiary manufacture, and even made from small native timber; but little skilled labor is required. The materials are all at hand, the product directly marketable. The process which has been given to the world by Deville is hampered with no patent. Here seem to be the conditions for at least one new industry in Ireland. Let us hope that the hint may not fall wholly unproductive.—*Robert Mallet, F.R.S.*

Increased Use of Asphaltum in Building.

Our experience in the use of asphaltum in the treatment of foundation and cellar walls fully confirms the following item from the *Western Manufacturer*, and we believe its use may be beneficially extended to many other purposes than those suggested.

The use of asphaltum in building is largely on the increase, principally employed as a prevention against damp cellar walls and mason work underground, also for watertight cellar floors, coating for rain water cisterns, covering for underground vaults, etc. The usual method of applying it is to reduce to a semi-liquid state, in a large iron pot, over a good fire, sufficient asphalt to about two-thirds fill it, care being taken that the flame does not rise over the top of the pot and ignite the asphalt. The wall is made as nearly dry as possible, and the joints somewhat rough, to admit of the asphalt penetrating the pores and securing a hold; the wall is then covered with asphalt, applied with a long-handled brush, while the material is hot and brushed in well—a coating one-half inch thick being as perfect a protective as a thicker one. A barrel of asphalt, as found in the market, heated and applied to vertical walls of brick, will ordinarily cover about two hundred and fifty square feet of surface, and produces most lasting results.

Basic Slag as Manure.

Dr. Munroe, F.C.S., Professor of Chemistry at the College of Agriculture, Downton, Salisbury, has issued a report on experiments made by him to test the germination and growth of farm seeds in various mixtures of garden soils and basic cinder made at the Northeastern Steel Works, Middlesbrough. The Professor points out the high manurial value of the phosphates contained in basic cinder, and gives the results of many experiments which have been most successful. Cargoes of basic slag have recently been shipped from Middlesbrough to different Continental ports, and one vessel has lately taken a cargo of 1,000 tons to Stettin.

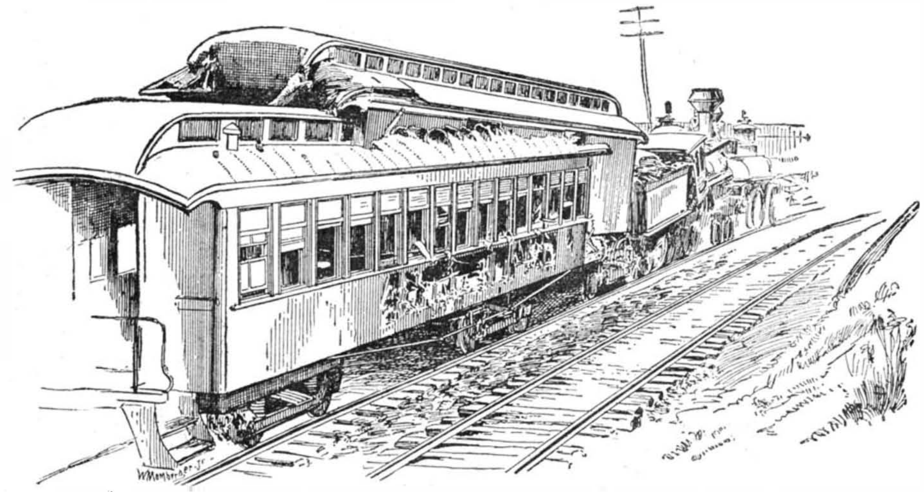


Fig. 3.—THE TELESCOPED CARS—EAST VIEW.

THE TRANSMISSION OF POWER BY ELECTRICITY BETWEEN CREIL AND PARIS.

The splendid experiments on the transmission of power to a great distance, undertaken by Mr. Marcel Deprez, backed by the Messrs. Rothschild, have just been passed upon officially.

After some previous attempts by the learned physicist, at the exhibitions at Paris (1881) and Munich (1882), at the Station of the North (1883) and at Grenoble (1883), the Messrs. Rothschild confided to a few engineers the business of preparing a programme and of carrying the same out.

The problem that Mr. Deprez had to solve was the following: To take a motive power of a hundred horses at the Creil station and transmit it electrically to the La Chapelle station, say to a distance of 33½ miles, with a performance of 50 per cent.

In order to carry out this project, Mr. Deprez worked for two years, and, after a few accidents, such as are unavoidable in an enterprise of this magnitude, now sees his efforts crowned with success. The machines began operating as long ago as the month of October, 1885, and the first examining committee began its labors at that time.

The Creil and La Chapelle plants and the line joining them were arranged as follows:

Creil Station.—The motive power was furnished by two locomotives, and was transmitted to a single machine, called a generator, through the intermedium of a dynamometric pulley that registered the electromotive force absorbed by the electric machine and the excitation of its magnetic field (Fig. 2).

La Chapelle Station.—The La Chapelle dynamo machine, called a receiver, was of smaller dimensions than the generator, since it received but half of the force expended at Creil (Fig. 1).

Line.—As the distance of the transfer was 33½ miles, the transmitting wire, going and coming, had a length of 67 miles. It was of silicious bronze, and was one-fifth inch in diameter. The effective duty furnished by the receiver was measured on a Prony brake.

Practically (and it was under practical circumstances that the receiver operated for six months), the power received at La Chapelle was employed for actuating the pumps of the Armstrong accumulators of the station (28 horses), and in addition, a second, doubly wound electric machine that distributed power to various apparatus (12 horses), as follows: 1. A 176 pound steam hammer of 2½ foot fall. 2. An electric brake. 3. An electric windlass. 4. A small motor that actuated a lathe. And 5. An apparatus for shifting switches; say, as a whole, an effective power of 40 horses, while at Creil one of 88 horses was expended, whence a performance of 45 per cent.

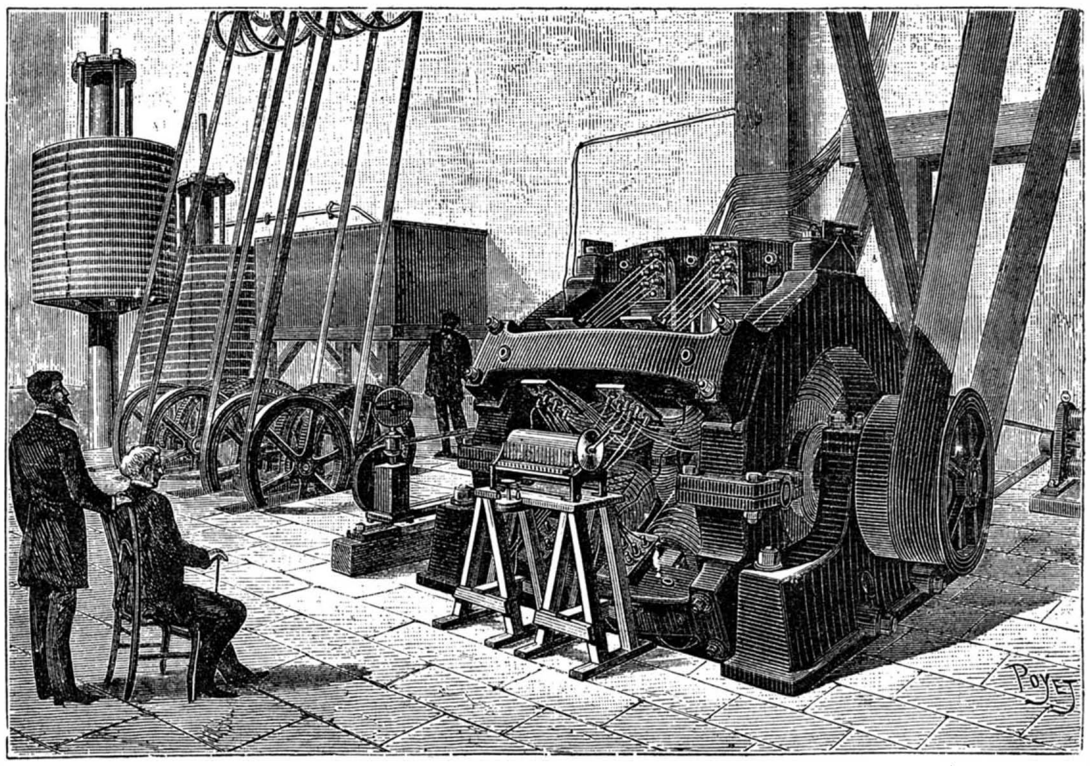


Fig. 1.—TRANSMISSION OF POWER BETWEEN CREIL AND PARIS.—THE RECEIVER.

The examining committee, presided over by Mr. Collignon from October until now, held numerous meetings, and made notes of several hundred points, on which it had made observations. It was found that, according to the velocities given the generator (which were very slight, since, at the periphery of the ring of the machine, the linear velocity did not exceed 25 feet), the effective work furnished by the receiver varied between 30 and 50 horse power, with a mean performance of 44 per cent.

In the month of May last, the Messrs. Rothschild asked a number of scientific and industrial notables to please follow the experiments and examine the value of the results. A committee of 38 was appointed, presided over by Messrs. Freycinet and Bertrand, and consisting, among others, of Messrs. F. De Lesseps, Alphand, Daubrée, Laussedat, Cornu, Mascart, Becquerel, Sartriaux, Aron, and Levy. This body at once appointed a sub-committee, under the presidency of Mr. Bertrand, and charged Mr. Maurice Levy with the duty of getting up a general report u[illegible] Mr. Deprez's experiment[illegible] the results ob[illegible] learned scient[illegible] pecially calle[illegible] amine the resu[illegible] the examinin[illegible]e. After a few pr[illegible] examinations, Mr. Levy proceeded, on the 24th of May, to verify the work. He had the generator run at angular velocities fluctuating between 170 and 220 revolutions, and ascertained that the receiver furnished an effective work that varied between 27 horse power with the lowest velocity and 52 with a maximum. The corresponding motive powers absorbed by the generator were of 66 and 116 horses; whence the performance of 41 and 45 per cent.

In the report which he has just made, and which has been unanimously adopted, Mr. Levy states that the results found by the committee are identical with those which had been daily observed by the engineers in charge of the experiments.

We join our appreciation of the matter to that of Mr. Levy, who concludes his report as follows:

"The committee, in the name of science and the industries, addresses its warm felicitations to Mr. Marcel Deprez for the admirable results that he has obtained, and expresses to the Messrs. Rothschild its deep gratitude for the inexhaustible generosity that they have displayed in this gigantic enterprise."—*La Nature.*

KEEP the roadsides free from stones and rubbish, and neatly mown. Don't let them be a nursery of weed seeds.

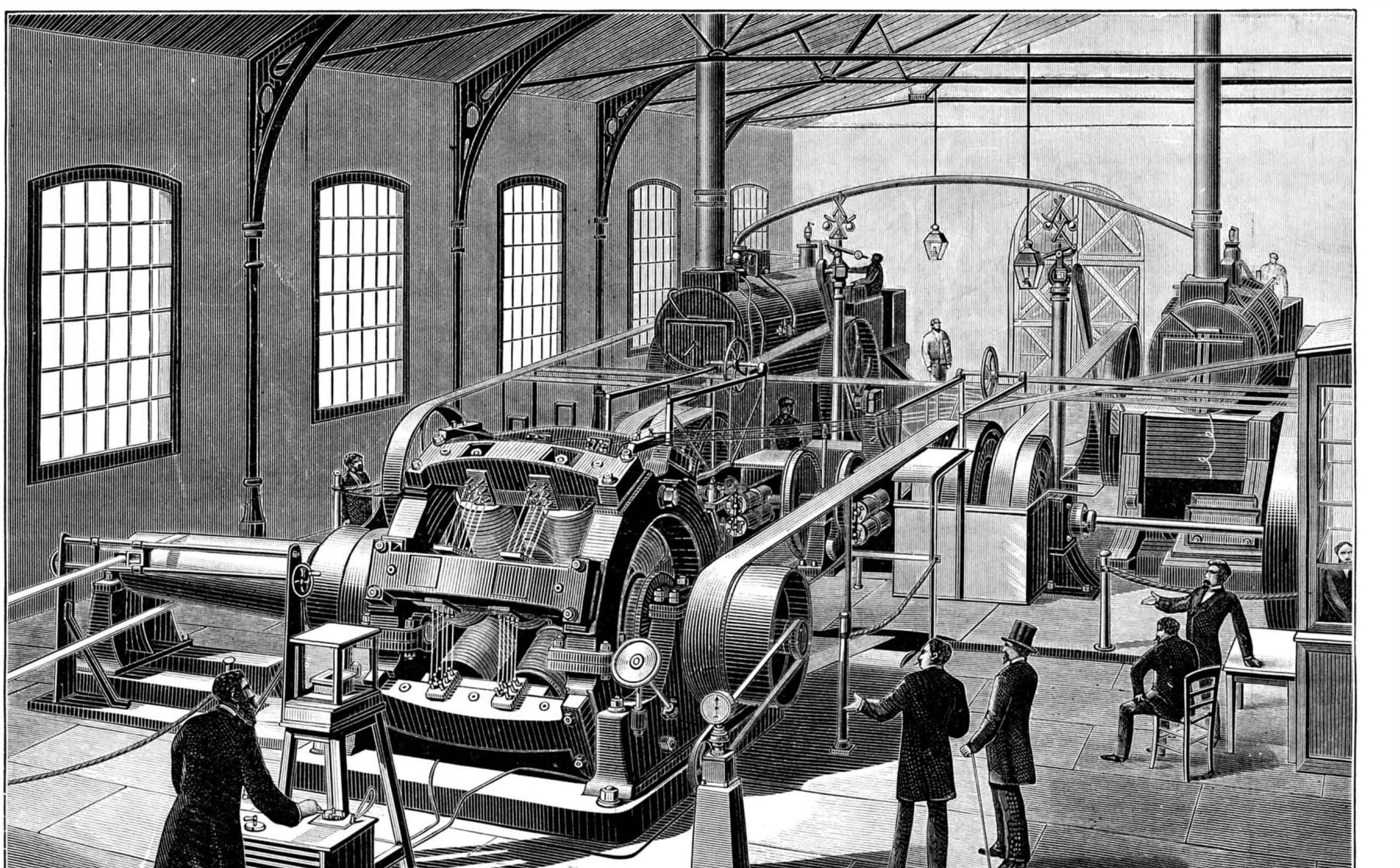


Fig. 2.—GENERAL VIEW OF THE STATION AT CREIL, SHOWING THE GENERATOR.

A BALL OF BIRDS.

It may perhaps be adduced as one of the most remarkable of the many curious and often inexplicable habits common to the lower animals of widely differing classes, the practice of forming themselves into balls or clusters, as is the case with bees, starfish, some kinds of bats, and at least two species of birds. One of these species is a swallow, found in Van Dieman's Land, the other, the subject of our present illustration, the mouse bird (*Colius Senegalensis*) of Central and Southern Africa. These strange little creatures, according to Le Vaillant, who describes them, generally live in small companies of five or six individuals, and generally select a densely foliaged tree, or thick mass of bushes for their gathering place. "Only those who have visited Africa," says Brehm, "and become acquainted with the remarkable characteristics of its luxuriant vegetation, can realize the actual appearance of the haunts thus selected as cities of refuge by these most strange and mouse-like creatures." Our readers must therefore try to picture to themselves a gigantic tree, with dense and usually thorny foliage, so interwoven with and embedded in the parasitical plants that grow around it as to be nearly concealed from view. In this green mass, which is impenetrable to man and beast, and even impervious to the attacks of the sportsman, the mouse birds make their home, creeping, like the animal whose name they bear, through such tiny and invisible crevices as to lead the spectator to imagine they have actually vanished from his sight, when suddenly a little head appears, and the bird makes its exit from the hole by which it entered. How they manage to creep in and out such of small apertures seems quite inexplicable. Le Vaillant describes their motions, while accomplishing this curious performance as being extraordinarily rapid. Their flight is performed with wings and tail outspread. While in the air, the whole party constantly utter their shrill cries, which are accompanied by a peculiar chirping sound. They but seldom rise to any great height while on the wing, and still more seldom settle on the ground. But the most extraordinary circumstance connected with these birds is the fact illustrated in the accompanying drawing of the habit they have of hanging on the branches in clumps like bees when swarming.

Peneaux, who verifies this statement of Le Vaillant, also mentions having seen them clinging to each other while asleep, the first bird holding on to the branch with one foot, while it supports a second bird by entwining one of the latter's legs with its own free limb; this second bird, in a like manner, supporting a third, and so on until they form a chain that often contains as many as six or seven of these living links.

It is a very handsome bird, and, as it plays about the branches, has an elegant appearance. Its long tail seeming to act as the balance pole, in the hands of a tight rope performer, in the extraordinary and varied attitudes which it assumes, and its highly movable crest being incessantly raised or depressed, gives it a very spirited aspect. The grasp of its feet is, of course, very powerful; but owing to their formation, which is entirely or almost wholly formed for grasping, it is in its way nearly as awkward as a sloth, whose feet are also made only for grasping. When upon the ground, among the boughs, however, it is as far from being slothful as it is possible to conceive, leaping about, all life and energy, with the quick vivacity that reminds the observer of the common long tailed titmouse. In lowering themselves from one branch to another, and in climbing, the mouse bird uses his beak to aid him, after the well known practice of the parrots.

The mouse bird is far from shy, and is easily captured.

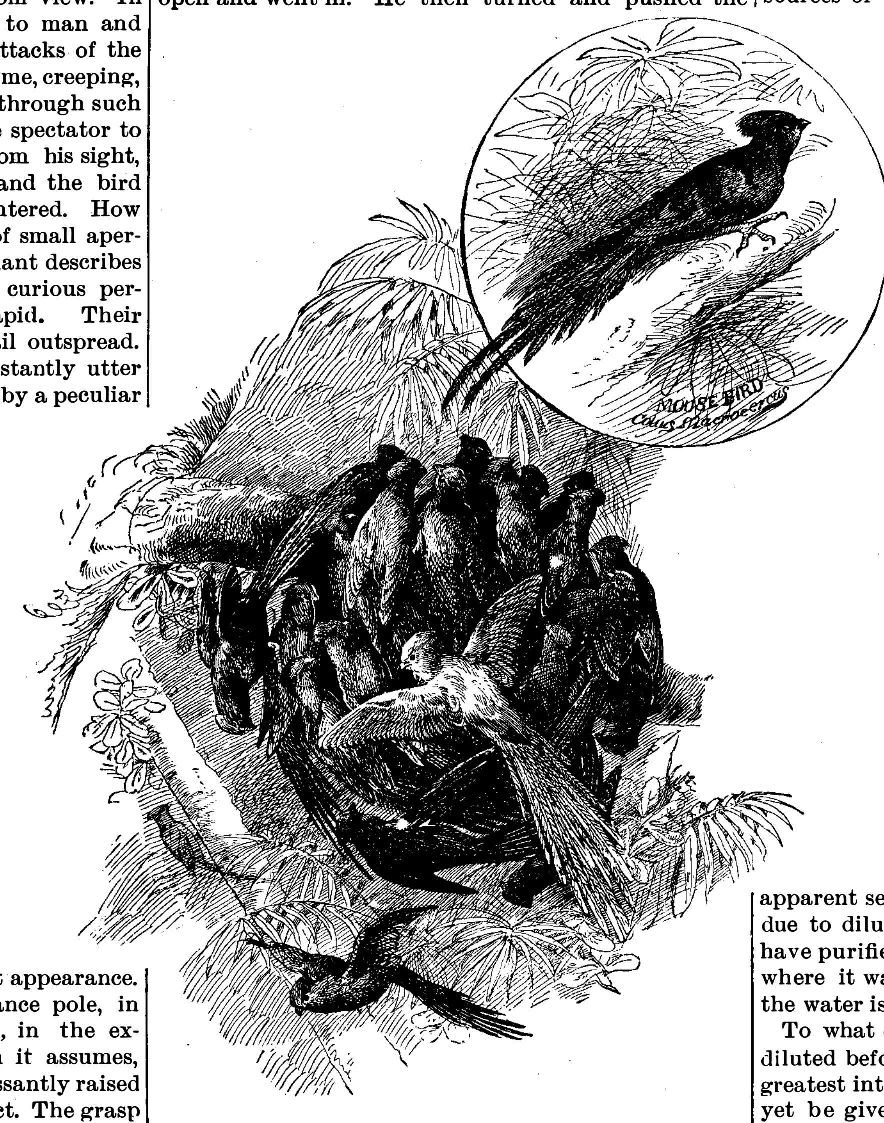
Le Vaillant says that in common with other members of the same family, that are fond of sleeping in the singular fashion adopted by these birds, they can often be found in the early morning so benumbed and drowsy that they can be taken with the hand before aroused sufficiently to loosen their hold from the bough they grasp so firmly. Their food appears to be limited to vegetable diet. The fruit of the plant called Christ's thorn affords them their principal subsistence, says Bichur; but they will also devour grapes, limes, and cactus figs, getting at them after the manner of a titmouse, by climbing over their surface.

At the Cape of Good Hope these birds are looked upon as formidable depredators. They occur at that locality in great numbers, and what renders it extremely difficult to guard against their attacks upon the ripening fruit and corn is that nets or similar precautions found effectual with other members of the feathered tribes are absolutely useless to prevent their incursions, if they have cast their eyes upon a tempting-looking supply of food, for they are perfectly fearless of scarecrows or such matters, and if an aperture exists, however small, their lithe, elastic bodies can penetrate it with the utmost ease.

The nests of the mouse birds are large and rounded, and are generally placed close together, five or six being found on the same branch. They are formed of roots of various kinds, cotton, wool, grass, and leaves. The brood consists of from three to seven eggs. The flesh of these birds, when fat and in good condition, is said to be excellent, and large numbers of them are shot at the Cape for the table. In size, the mouse bird is about equal to our common blackbird.

Canine Reason.

S. N. Maxcy, of Gardiner, Me., has a black and tan dog which is very intelligent. He has all the accomplishments a common dog has, and knows several besides. The screen door of the house opens outward, and Dick can open it from the outside, pulling it with his teeth. The other day he approached the door with a bone in his mouth. He couldn't open the door while he held the bone, and if he couldn't have the bone he didn't care to open it. He looked at it a minute, then laying the bone down near the door, pulled the door open and went in. He then turned and pushed the door wide open, and before it could swing to again, had grabbed up his bone and got inside.—*Exchange.*



A living ball of birds

A bird dog owned in this town, though we doubt much if he has been shot over, is in the habit of making furious dashes at the doves feeding in the streets, and of course the birds are too quick for him. The other day he watched his opportunity in this wise: The dog saw the doves, and also saw a team approaching; he waited until the team was between himself and the birds, then he made a tremendous rush between the wheels, and the birds, not seeing his first leap, were taken in a heap of surprise, and one dove was nearly captured.

Both these cases look a trifle like an exercise of the reasoning power.

Dr. C. A. Packard, of Bath, owns a setter of very fine blood, when young a capital bird dog, but too old now to hunt. He runs with the carrriage for short drives occasionally. One day, when on the road, poor Flash had the misfortune to nearly tear out one of his nails, and the doctor was obliged to use the bone forceps to remove the nail. Flash stood the operation "like a major," never wincing. Not long after this the doctor heard the well-recognized rap of Flash on the office door for admission. It was opened, and in came Flash, accompanied by a small dog with a bad wound upon one leg, and Flash brought the dog up before his master. The doctor attended to the binding up of the leg, and then Flash went out with his little friend, probably seeing him home.—*Brunswick Telegraph.*

[Flash, whom we have known for years, is a well-trained Irish setter, and is a dog of unusual docility and intelligence.—ED.]—*Amer. Naturalist.*

Dangers of Polluted Water.

Dr. Willis G. Tucker, in a paper read before the Albany Institute, says: As regards the natural purification of polluted waters, while the tendency of all organic matter, animal or vegetable, is toward ultimate death and final destruction by oxidation, it is as yet impossible to say how rapidly such a destruction goes on in many cases. The Rivers Pollution Commission mixed urine with water, in the proper tion of one part of urine to 3,077 of water, agitated the mixture from time to time, and analyzed samples. At the end of the eleventh day the improvement in the water was so inconsiderable that other experiments were made in which a stream of impure water was allowed to flow from one vessel to another, and was thus freely exposed to the air, and as a result of these experiments the commissioners concluded that purification by natural oxidation had been greatly overrated, and that "there is no river in the United Kingdom long enough to secure the oxidation and destruction of any sewage which may be discharged into it, even at its source." They also conclude that "rivers which have received sewage, even if that sewage has been purified before its discharge, are not safe sources of potable water." (Rivers Pollution Commissioners' 6th Report, pp. 134–8.) Upon this point Frankland says: "Twelve years ago there was a general impression among chemists and others that polluted water quickly regained its original purity by spontaneous oxidation. The opinion had no foundation in quantitative observations; indeed, there was not a single experimental fact to prove it. . . . The impression had gained currency from the improved appearance of a polluted river after a flow of a few miles. . . . Two classes of persons strongly interested in its acceptance were chiefly instrumental in the origination and diffusion of this opinion. These were, first, the polluters of running water, and, secondly, water companies drawing their supplies from below the sewer outfalls of towns." (*Journal Chemical Society*, May and July, 1880.) Such improvement as does take place in running streams probably depends more upon the part played by fresh water plants and micro-organisms than upon direct chemical oxidation, and of course no accurate conclusions can be reached as to the effect of these varying and little understood agencies. Mere dilution also doubtless accounts for the apparent disappearance of much noxious matter. Professor William Ripley Nichols, in his Water Supply, italicizes the following statement: "The apparent self-purification of running streams is largely due to dilution, and the fact that a river seems to have purified itself at a certain distance below a point where it was certainly polluted is no guarantee that the water is fit for domestic use."

To what extent, therefore, must a polluted water be diluted before it is safe to use, is a question of the greatest interest, but one to which no answer can as yet be given. Nor can we prove that the specific poisons of certain diseases—admitting their existence—may not contain living organisms capable of rapid multiplication, nor can we tell for how long a period or under what conditions these organisms may retain their vitality. In this absence of positive knowledge, but in the light of countless facts which all but prove our suppositions true, we had best err, if err we must, on the safe side, avoiding the use of polluted waters and recognizing the fact that, although chemical analysis may detect no impurities in a water, it is not, therefore, necessarily safe to drink.

Influence of Magnetism on Chemical Reaction.

Mr. E. L. Nichols, in the *Journal of the Chemical Society*, describes a set of experiments with aqua regia, nitric acid, hydrochloric acid, and sulphuric acid to illustrate the phenomenon that when finely divided iron is placed in a magnetic field of considerable intensity and exposed to the action of the acid, the chemical reaction differs in several respects from that which occurs under ordinary circumstances. With aqua regia, it was found that the speed of reaction is greater in the magnetic field than without, and that the heat of chemical union is much greater. With nitric acid, the effect of the magnet was to greatly increase the speed, reducing the average time from eight minutes to less than one minute. With sulphuric acid, the reaction was uniform and complete, and apparently of the same chemical character within and without the fluid. The magnet was found, however, to increase the speed of reaction, and to decrease the amount of heat produced. A series of measurements was made with nitric acid, in which powdered copper was substituted for iron. The reaction in the field was found to be identical with that which occurred when the magnet was not in action.

Natural History Notes.

Action of Light upon Eyeless Animals.—In the Proceedings of the Vienna Academy, Mr. Graber describes some experiments that prove that animals deprived of eyes are sensitive to light. He took a box divided into three compartments by parallel partitions, each of which was provided with two neighboring apertures. One of these latter he covered with a piece of wood, and exposed the box to the light. In this way, half of each compartment was lighted, while the other was dark. Then he put a number of earthworms into each compartment, and distributed them as equally as possible. From time to time, he removed the cover of the box and counted the worms that were opposite the open aperture and those that were opposite the closed one. Then he distributed them equally to the right and left, and put in more every four hours. The results of several experiments were that there was a total of 210 worms in the dark parts and 40 in the lighted ones. As, at the beginning of the experiment, the worms were distributed equally over the surface of the box, Mr. Graber concluded that 85 (that is, two-fifths) had shunned the light. He likewise studied the action of different rays upon these animals, and, by employing red and blue glass, for example, found that the worms manifested a marked preference for red light.—*La Nature.*

The Development of Club Mosses.—The important investigation of Dr. Treub on the development of the *Lycopodiaceæ* is continued in the "Ann. du Jardin Botanique de Buitenzorg," vol. v., part ii., and in this part the sexual organs of *L. phlegmaria*, L., are described. They are produced invariably on the upper surface of the prothallus, and are always accompanied with paraphyses. The position of the antheridia is variable, being sometimes scattered on the branches and sometimes associated in groups, and borne on the thickened extremities of the branches. The antherozoids have two cilia and resemble those of *Selaginella.* The archegonia appear subsequently to the antheridia and occur on the thickened branches which have already borne antheridia. They project from the prothallus and have three to five canal cells. In the fact of having more than three canal cells, and in the presence of paraphyses, *L. phlegmaria* approaches the Muscineæ. The prothallus also possesses two modes of vegetative propagation, in which it bears some resemblance to the genus *Blasia* in the Hepaticæ. This adds to our knowledge of the connecting links between the Pteridophyta and Muscineæ.

Preservation of Flowers.—The *Chronique Industrielle* says that flowers may be preserved with all their brilliancy and freshness in the following way: In a well corked bottle, dissolve 6 drachms of coarsely cracked, clear gum copal, mixed with the same weight of broken glass, in 15½ ounces (by weight) of pure rectified sulphuric ether.

Soak the flowers in this mixture, take them out slowly, and expose them to the air for ten minutes; and then immerse them anew, and again expose them to the action of the air. Repeat this operation four or five times. The flowers thus treated will keep for a long time if care be taken not to handle them too much.

Curious Mimicry by a Spider.—A curious case of mimicry by a spider has been recorded by Mr. H. O. Forbes. The spider in question is found in Sumatra, and has been named *Thomisus decipiens.* On June 25, 1885, in a forest of Sumatra, Mr. Forbes' attention was excited by his "eyes resting on a bird-excreta marked leaf." On examination it was found that the appearance was deceptive, and had been produced by a spider which had so closely copied nature that the imitation would readily deceive the uncritical observer. "The spider is in general color white, spotted here and there with black; on the under side its rather irregularly shaped and prominent abdomen is almost all white—of a pure chalk white; the angles of the legs are, however, shining jet black. The spider does not make an ordinary web, but only the thinnest film on the surface of the leaf. The appearance of the excreta rather recently left by a bird on a leaf is well known. There is a pure white deposit in the center, thinning out round the margin, while in the central mass are dark portions variously disposed; as the leaf is rarely horizontal, the more liquid portions run for some distance. Now, this spider one might almost imagine to have in its rambles marked and inwardly discerned what it had observed, and had set about practicing the wrinkles gained; for it first weaves a small irregular patch of white web on some prominent leaf, then a narrow streak laid down toward its sloping margin, ending in a small knob. It then takes its place on the center of the irregular spot on its back, crosses its black angled legs over its thorax, and waits. Its pure white abdomen represents the central mass of the bird's excreta, the black legs the dark portion of the slime, while the web above described represents the more watery marginal part (become dry), even to the run-off portion with the thickened knob (which was not accidental, as it occurred in both cases), like the residue which semi-fluid substances, ending in a drop, leave on evaporation. It keeps itself in position on its back by thrusting under the web below it the spines with which the anterior upper surface of the legs is furnished."

The most interesting fact of all, in the opinion of Mr. Forbes, is "not so much that of the spider having gained, which it can, of course, have no consciousness of, by natural selection, the color and form of an excretum, but that it has acquired the habit of supplementing its own color and form by an addition in such absolute harmony with that of which itself is the similitude."

First Appearance of the Grasses.—At a meeting of the Geologists' Association, held at London, April 2, J. Starkie Gardner discussed the points bearing on the geological period at which grasses first began to assume a preponderating position in vegetation. Their value and importance at the present day were first sketched, and it was remarked that they occupy, under cultivation, one-third of the entire area of Europe, inclusive of lakes and mountains. . . . There are over 3,000 species fitted to occupy most diverse stations and to overcome nearly every kind of competition, under no matter what conditions, with the result that about 95 per cent of the plants growing in ordinary meadow land are grasses.

The conclusion arrived at was that there was no great development of grasses until toward the close of the Eocene, no definite remains being associated with any of the older Eocene floras of temperate latitudes. A number of facts were brought forth to show that grasses could by no possibility have failed to become associated with the remains of other plants in beds deposited under such conditions as those of the Eocene, had they existed in any profusion then, while, further to support this argument, it was stated that the very similar Oligocene and Miocene beds all over Europe are crowded with them. Further, it was shown that the dentition of all the early Eocene herbivora was adapted for crushing fruits, snapping twigs, and grubbing roots, rather than for browsing on such food as grass, so that the evolution of true graminivora . . . must be post-dated to the appearance of the grass itself. The geological history of the whole class of insects was reviewed, with the object of supporting the conclusion arrived at as to the *post* mid-Eocene date of grass. Older remains of grass may, however, occur in the last series of Tertiary deposits in Spitzbergen, but as yet their age has not been accurately correlated. Finally, it was shown that the introduction of an aggressive type in vast numbers, of different habits, to pre existing vegetation, exerted an influence upon terrestrial life altogether without parallel, and for the first time rendered possible the development of a meadow and prairie vegetation distinct from that of marsh, scrub, and forest, with all the attendant forms of animal and vegetable life to which such vegetation is indispensable.—*Amer. Naturalist.*

The Flukes of Whales.—What are the flukes of whales? This, it appears, is a question that cannot be satisfactorily answered at the present time, and at least there is a diversity of opinions in respect to their homologies. Do they simply represent a laterally expanded tail, or are they the remnants of the posterior feet of quadruped ancestors? A difference in interpretation has long prevailed, and the subject has been made prominent recently by some memoirs or addresses of Prof. W. H. Flower. By some old naturalists, and even by Linnæus, the flukes were regarded as tantamount to the entire hind limbs. Not long ago, Gill suggested that the flukes represent the hypertrophied integuments of the hind limbs, while the osseous portions partially persist in the rudimentary bones located far in front of them. Lastly, Prof. Flower has again taken up the question. "One of the methods," says he, "by which a land mammal may have been changed into an aquatic one is clearly shown in the stages which still survive among the carnivora. The seals are obviously modifications of the land carnivora, the Otaria, or sea lions and sea bears, being curiously intermediate. Many naturalists have been tempted to think that the whales represent a still further stage of the same kind of modifications. But there is to my mind a fatal objection to this view. The seal, of course, has much in common with the whale, inasmuch as it is a mammal adapted for an aquatic life, but it has been converted to its general fish-like form by the peculiar development of its hind limbs into instruments of propulsion through the water, for, though the thighs and legs are small, the feet are large, and are the special organs of locomotion in the water, the tail being quite rudimentary. In the whales the hind limbs are aborted and the tail developed into a powerful swimming organ. Now, it is very difficult to suppose that when the hind limbs had once become so well adapted to a function so essential to the welfare of the animal as that of swimming, they could ever have become reduced and their action transferred to the tail. It is far more reasonable to suppose that whales were derived from animals with large tails, which were used in swimming, eventually with such effect that the hind limbs became no longer necessary, and so gradually disappeared. The powerful tail, with lateral cutaneous flanges, of an American species of otter (*Pteronura sandbachii*), or the still more familiar tail of the beaver, may give some idea of this member in the primitive cetacea."

A New Species of Fungus has been discovered by M. Galippe, which was developed in human saliva. It has been referred to the genus *Monilia*, and it is proposed to call it *M. sputicola* (*Comptes Rendus*, cii., p. 1186). It does not appear as yet whether the saliva which gave rise to the mycelium and spores was derived from a healthy person or otherwise.

The Blue Color of Animals.—Prof. F. Leydig says that a blue granular pigment is rarely found in animals; in the crayfish, for example, there are blue crystals. The blue color is oftener due to interference, owing to the presence of lamellæ or to the fibrils of connective tissue, as in the *tapetum fibrosum* of the eye of ruminants; the *corium* of the living larva of *Pelobates fuscus* is similarly blue. A dull material overlying black pigment produces blue, as in the case of blue eyes, which are due to the urea shining through the non-pigmented iris, and in some frogs. Dark chromatophores have a like effect, as has too the swelling of the corium consequent on the filling of the lymph spaces. In conclusion, the author discusses the tegumentary secretions, which are of various colors, and which can be washed away; an example is to be seen in the celestial blue color of the abdomen of *Libellula depressa* and, perhaps, the "bloom" of the pupa of the Apollo butterfly. On the other hand, the coloring matter may be in the cells of the epidermis, as is the case with the rosy color of *Tetrao urogallus*, and can then, of course, be removed only after the destruction of the tissue which contains it.—*Jour. Roy. Microscop. Soc.*

Give the Boys a Chance.

In July there was a convention of glass blowers at Atlantic City, N. J., and during the session a resolution was adopted abolishing the apprentice system in glass factories. The matter, of itself, has perhaps small importance, but it is significant of the tendency of the labor movement, and it has an interest beyond the narrow boundaries of the glass industry, because similar action has already been taken by other trades. The point involved is just this: Men who are earning their bread at skilled labor formally declare that no American boy shall be allowed to acquire the skill required to perform that labor. They turn their backs on the five or six million young men and boys in this country, and deny their right to become expert mechanics. The purpose, of course, is to make skilled labor scarce and so to keep up wages. The result is to exclude the young from the chance to earn good wages, to force many of them into idleness and to tempt others into crime. Against such a system the people of the country have a right to make vigorous protest. It is a matter that affects society at large. It touches directly every man who has children, and indirectly every human being, from the lowest to the highest. The right of a boy to learn any honest trade that he wants to learn is positively indisputable; and to this is joined the clear right of every employer to take a boy into his shop to help him to acquire knowledge and skill. The denial of these rights by a trade union is tyranny, and it ought to be resisted to the last extremity. We assert that the solitary chance of the success of the labor movement, so called, lies in its obedience to the requirements of justice. When it sets justice at defiance, it is doomed. The people of this country are not going to permit any body of men to trample the most ordinary human rights under their feet.—*Textile Record.*

Rubber Milk.

The method of treatment for congealing the rubber milk in the Para district, which equally applies to the milk of the *Hevea braziliensis* and *Mangaleira*, is as follows:

Small cups are attached to the trees, and, when filled with juice, are emptied into tin pails of a certain size, having close fitting lids, the cups being again attached to the trees. After going the round of the trees, the contents of this pail are emptied into another a size larger, and so on, till the covered pail of largest size is filled and ready to be strapped on to the saddle of a mule for removal. By this plan the natives are saved the trouble of condensing and preparing the milk for market, by smoking. The large can of rubber milk, on arriving at the *magasin*, is emptied into a bath of water, the temperature best suited to the rubber being a matter of experience. The lumps of rubber that form in the bath are immediately pressed into thin, flat sheets, and carefully wiped. By this means the acid is forced out of the cells or pores in the lump, thus preventing the so-called "rotten" appearance. The author is of opinion that the African rubbers yielded by the Landolphias, prepared in this manner, will produce a strong rubber. The African rubbers now sent here do not yield, when strained and cleaned, more than 30 per cent to 55 per cent of pure rubber gum, owing to the natives adulterating with sawdust, bark dust, etc., to overcome the inconveniences of the stickiness of the juice. The amount of resin in milk varies largely.

ENGINEERING INVENTIONS.

A steam governor has been patented by Mr. John Gerhardt, of Montreal, Quebec, Canada. The governor valve is operated by pivoted vanes arranged to be acted upon by centrifugal force and the resistance of the air for opening the vanes against the tension of a main spring arranged to normally hold the vanes closed or drawn inward toward the axis of the governor.

A check valve has been patented by Mr. Adam D. Glace, of Rocklin, Cal. This invention covers certain novel features in the making of a simple and inexpensive valve, intended to close positively to cut off a back pressure, thereby promoting durability and avoiding an overheating of an injector or inspirator, and preventing waste of any fluid passed through the valve.

A method of and apparatus for cooling furnace bosh jackets has been patented by Mr. James L. McMichael, of Glen Wilton, Va. This invention covers new means of applying and controlling the water, the construction being such that the water sprayed against the bosh from perforated tubes flows rapidly down to several troughs so arranged as to allow currents of air to act on the water and keep it cool.

A gas engine has been patented by Mr. Johannes Spiel, of Berlin, Germany. It has novel devices, whereby, with the first stroke of the piston, an explosive mixture of air and benzine, or naphtha, etc., is sucked up, while with the second stroke the mixture is compressed, and during the third stroke ignition at the dead point takes place, with explosion and expansion, the ignited gases being expelled with the fourth stroke.

A jointed link for engines has been patented by Mr. Edson Doe, of South Newbury, Vt. Combined with the crank shaft of an engine, the eccentric attached thereto, and the eccentric rods, and the crank shaft connected with the valve stem, is a jointed link and its holding bar, intended to give a perfect lead and cut off on both forward and back motion, each eccentric working independently, and one part of the link not affecting the movement of the other part.

MECHANICAL INVENTION.

A pivot cutting implement has been patented by Mr. Amos A. Wolcott, of Tom's River, N. J. It has a slotted spindle and slotted collar, with adadjustable and removable cutters, springs, and adjusting rod, making a device for cutting pivots or bearings adapted to be used in ordinary lathes or by hand.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Mr. Frank H. Rybacek, of Riverside, Iowa. It has seed droppers operated by sliding clips, which are actuated by levers carrying daggers, the invention being an improvement on a former patented invention of the same inventor, relating to improved device for operating the daggers.

A check row corn planter has been patented by Mr. Silvanus F. Enos, of Etna, Ill. It is so made that the seed will be dropped at uniform distances apart, the lines of the cross rows be marked, and that it can be readily operated to retard or hasten the dropping of the seed, while the dropping mechanism can be thrown out of gear by raising the forward part of the machine from the ground.

MISCELLANEOUS INVENTIONS.

A brush has been patented by Mr. William F. Howard, of Claremont, N. H. It has a U-shaped core, with tongues bent back as a fastening piece for bristles or other brush material, with other novel features, whereby a substantial article is produced in a simple and cheap way.

A steam clothes washer has been patented by Mr. Charles Boaz, of Utica, Ill. It consists of a clothes box made to be inserted in a boiler in such way as to leave a steam space under it, a vacant space at the sides, and a condensing chamber at the top, whereby the clothes will be washed exclusively by steam, and do not come directly in contact with the water.

A station indicator has been patented by Mr. Charles E. A. Brandes, of Brooklyn, N. Y. The invention consists of signs attached to bent rods hung on a cylinder having a transverse slot, a box being secured to the car and forming a bearing for the cylinder, making a simple and easily operated device for indicating any desired station at any desired time.

A flying target has been patented by Mr. Joseph H. Jacobs, of Atchison, Kan. It is made with sheet metal body, and has at its center an opening fitted to contain an image, instead of which a live bird may be used, making the target also a trap, the bird or image being released when the target is struck, and the target being one which can be repeatedly used.

A buggy iron has been patented by Mr. D'Alton Topliff, of Franklin, Ill. It is an angled iron, to be attached to the sills near their ends, and extended under the edges of the panels of the body to sustain the ends of the panels, the buggy body being of the usual description, with side panels and end boards, and having sills extending along the inner side of the panels at the bottom of the body.

A photographic camera has been patented by Messrs. Richard A. Anthony and William H. Lewis, of New York city. It is in the form of a hand bag or satchel, containing and concealing the camera, with apertures for the finder and camera tube, having doors which form, when closed, parts of the walls of the case, so that the user may carry and use the camera without being noticed.

A fence post has been patented by Messrs. William H. H. and Solomon Yount, of Troy, O. The post is preferably made of angle iron, with its lower end shaped to have attached thereto a base or point to go beneath the ground, and provided with flanges of sheet metal, the forward face of the post being perforated to receive staples by which fence wires are fastened in place.

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

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If anything clogs the waste pipes in the house, we become alarmed, for sewer gas is apt to generate disease. The children, then, are removed to their grandparents', or kept out of doors as much as possible, until the defect is remedied. But the waste pipes of the human system are often allowed to clog, and the sufferer, who cannot get away from the poison, becomes unfit for work or pleasure. In such cases, Dr. Pierce's "Pleasant Purgative Pellets" will gently remove the cause, and the effect will vanish of itself. By druggists.

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Curtis Pressure Regulator and Steam Trap. See p. 142.

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NEW BOOKS AND PUBLICATIONS.

THE MANUFACTURE OF PAPER. By Charles Thomas Davis. Philadelphia: Henry Carey Baird & Co.

This book fills a place, hitherto vacant, in the very considerable library of industrial publications issued by Messrs. Baird & Co. It is a comprehensive treatise on the fabrication, coloring, and finishing of every kind of paper, explaining the differences in the wide variety of raw materials used, and describing the tools, machines, and practical details of the business. As in former books of which Mr. Davis is the author, the reader is referred to long lists of patents taken out on machines and processes employed in the industry treated of.

THE LIFE OF ROBERT FULTON. By Thomas W. Knox. New York: G. P. Putnam's Sons.

A popular newspaper correspondent, and the writer of numerous entertaining books for young people, has here thrown together a sketchy account of the early American promoter of steamboat navigation and what he did, embracing many particulars germane to the matter which would be likely to interest a youthful reader.

THE BATTLE OF GETTYSBURG. By the Comte de Paris. Philadelphia: Porter & Coates.

This is a detached portion of the author's history of the Civil War in America, the importance of the battle of Gettysburg as a decisive turning point in the four years' conflict rendering its full treatment in a special volume a work of independent value. It is evident that great pains have been taken to render the account as accurate as thorough subsequent investigation could make it, and that the opinions expressed are entirely without partisan bias. The author's distinguished position, the facilities for observation afforded him as a staff officer, and the care which has been taken in collating information from the official records of both armies, all tend to make this one of the most generally satisfactory accounts of the battle that has yet appeared.

REPORT OF THE NEW YORK FOREST COMMISSION, 1885. Albany: The "Argus" Company, State Printers.

This volume is a most welcome indication that something substantial is at last being done toward the preservation of a portion of the virgin forests of the State, particularly in the Adirondack region, of which a most excellent map is given, showing the woods that are left. The dissemination of such information cannot but have a useful effect in securing the proper legislation for the preservation of the woods of these northern regions.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) A. E. M. asks for any practical and simple way of keeping furniture free from wood borers, in a house infested with them, and if anything besides arsenic will kill these—for example, carbolic acid. A. You might try painting the wood with a solution of corrosive sublimate in alcohol. Carbolic acid in sufficient quantity would dispose of them. Both these are violent poisons.

(2) E. B. asks: 1. At what temperature does oxygen unite with carbon, that is, how high does the temperature of a mass of coal have to be before combustion takes place? A. At a low red heat; about 1,000° F. 2. Will oxygen unite with zinc or any other substance as readily when combined with hydrogen, and being in the form of water, as it will when uncombined, or as common air? A. It will not. 3. Is a loud sound heard any further than a light sound in an acoustic telephone? A. It is.

(3) B. F. W. writes: Have plate and other glass splashed with lime by plasterer. How can it be removed without injuring glass? A. Dilute muriatic acid will remove the stain, after you have scraped off the bulk of the lime. You will not injure the glass, but the acid will spoil the frame if allowed to act upon it. Apply with a sponge.

(4) C. G. B. writes: 1. I have a cane that I prize highly, with a tortoise shell handle, which I wish to bend to an opposite shape. Can it be softened without injury, and so bent? A. We should not advise you to attempt it yourself. It can be done by softening in steam, bending, and polishing. 2. At certain seasons, lemons are scarce and dear. Can the juice be preserved by bottling or canning for future use, and how? A. *a.* Keep the filtered juice, before it has passed into fermentation, without adding alcohol, in a bottle hermetically sealed. *b.* Heat the fresh juice not compounded with alcohol in a vessel to the boiling point, and close while boiling. *c.* Compound the unfermented juice with 10 per cent of alcohol and heat as in *b.* *d.* Fill the fermented juice in bottles without an addition of alcohol and without heating. *e.* Heat the fermented juice without an addition of alcohol in a closed vessel to the boiling point, and close while boiling. *f.* Compound the fermented juice with 10 per cent of alcohol, and heat as in *e.*

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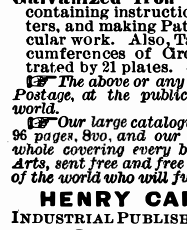

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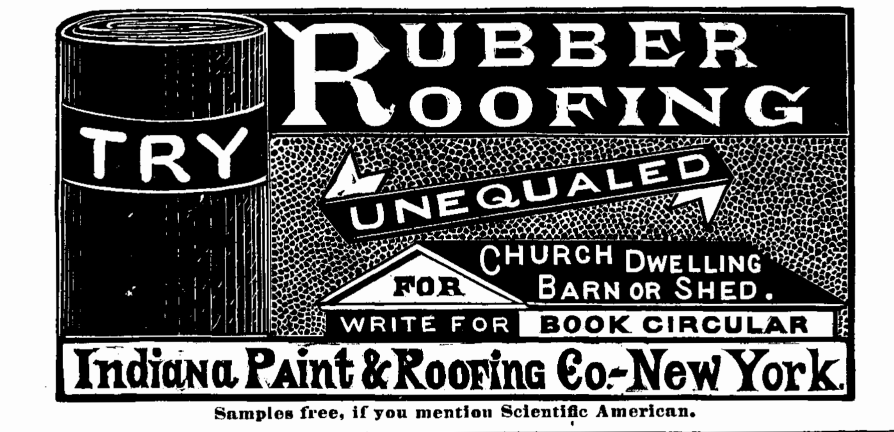

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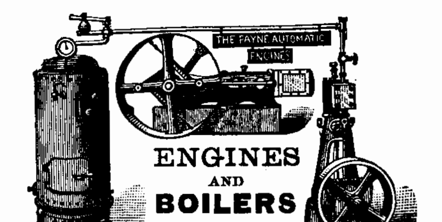

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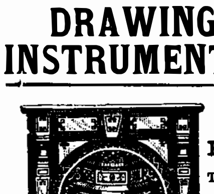

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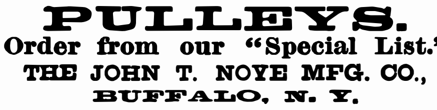

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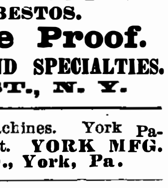

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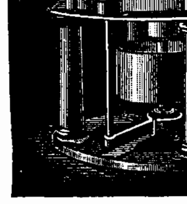

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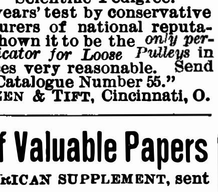

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TO THE STEEL MANUFACTURERS OF THE UNITED STATES OF AMERICA.
UNITED STATES NAVY DEPARTMENT,
WASHINGTON, D. C., Aug. 21, 1886.

The attention of all steel manufacturers of the United States is hereby invited to the requirements of the Navy Department in the way of armor-plates and heavy gun forgings, for the prosecution of work already authorized by Congress.

This advertisement invites all domestic manufacturers of steel to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor-plate required for modern ordnance and armored ships; and no bids will be considered except such as engage to produce within the United States either all the gun-steel or all the armor-plate (or both) specified in this advertisement; nor will any bid be accepted unless accompanied by evidence satisfactory to the Department that the bidder is in possession of, or has made actual provision for, a plant adequate for its fulfillment.

Bids are hereby invited for supplying this Department with the under-mentioned material:

About 1,310 tons of steel gun-forgings, of which about 328 tons will be for guns of six inches caliber, 70 tons for guns of eight inches caliber, and 912 tons for calibers between ten inches and twelve inches (both inclusive).

These forgings are to be delivered rough bored and turned, and when in that state the heaviest forging which enters into the construction of a gun of each of the desired calibers will be about as follows:

6-inch ..... 3¼ tons.
8 " ..... 5 "
10 " ..... 9¼ "
10½ " ..... 9¾ "
12 " ..... 12½ "

All these forgings must be delivered within the following times from the closing of a contract, viz.:

For 6 inch guns, 28 within one year, and the remainder within 18 months.

For 8 inch guns, within two years.

For 10 inch and larger guns, within 2½ years.

Preference will be given for earlier deliveries.

Also, about 4,500 tons of steel armor-plates, to be of the best material and manufacture, shaped exactly after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

20 feet by 8 feet by 12 inches thick.
17¼ feet by 6 feet by 17 inches thick.
11½ feet by 4¼ feet by 6 inches thick.
There will also be thinner plates.

For information concerning shapes and weights of the gun forgings and armor-plates, what parts must be manufactured in sets, time of delivery of each set, the chemical, physical, and ballistic tests, which the metal must sustain in each case, and for all other particulars, apply to the Chief of Bureau of Ordnance, Navy Department, Washington, D. C.

Each bid upon armor-plate must specify the time within which the bidder will engage to make delivery; and preference will be given to earliest proposed deliveries.

Proposals must be in duplicate, sealed and addressed to the Secretary of the Navy, Navy Department, Washington, D. C., the envelopes indorsed "Proposal for steel gun-forgings and armor."

They will be received at the Navy Department until 12 o'clock M. on the 10th day of December, 1886, at which hour the opening of the bids will take place.

The right is reserved to waive defects in the form of, and to reject any or all bids.

Ten per cent. of the contract price will be retained from the payment for each article delivered, until the contract, as far as relates to articles of that class, shall have been completed.

Separate bids may be submitted for the gun steel and for the armor, if any manufacturer so desires; but bids covering both will receive preference, other things being equal.

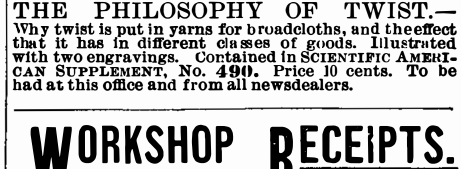
Bids will be compared in two classes.

First. Gun Forgings.

Second. Armor-plate.

And the total sum for which, and the time within which the whole of the material covered by each class will be produced and delivered will be alone considered.

WILLIAM C. WHITNEY,
Secretary of the Navy.



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