SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LIX.—No. 2. [NEW SERIES.] NEW YORK, JULY 14, 1888. [$3.00 per Year.

REPRODUCTION OF ARTICULATE SPEECH AND OTHER SOUNDS.

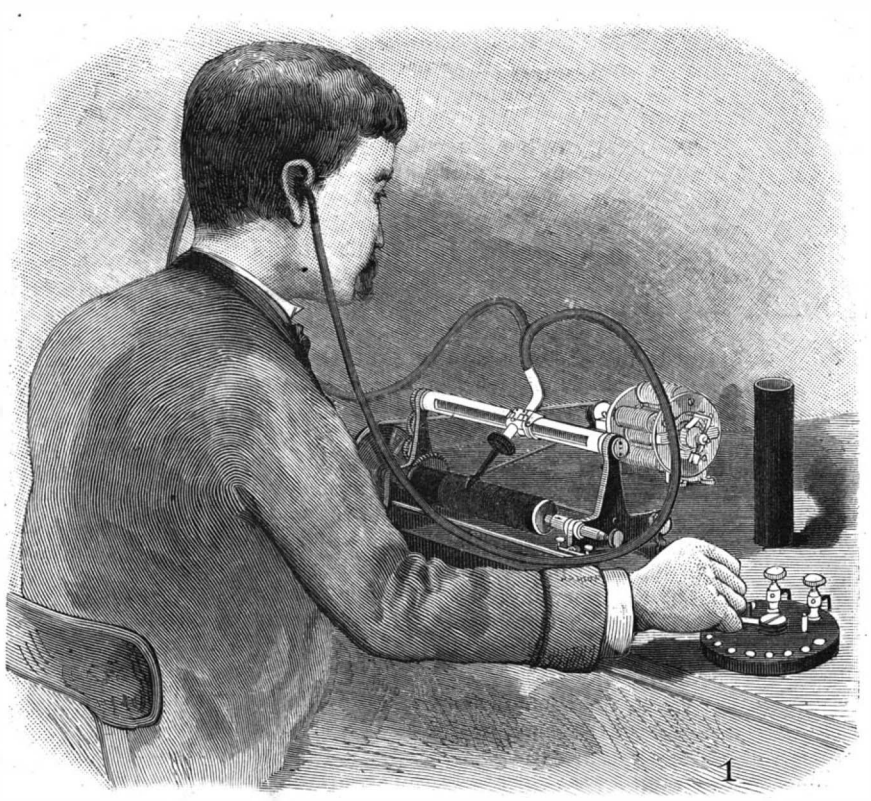
The transmission of articulate speech—as wonderful and useful as it is—is fully equaled in point of novelty by the instruments for recording, preserving, and reproducing speech. Without doubt, these "speech reproducers" are destined sooner or later to take a large place in business and social transactions. No one who has given the matter a moment's thought will fail to see the utility of a practical machine of this sort.

Leon Scott long ago devised a simple and curious instrument known as the phonautograph, in which the vibrations of a diaphragm were recorded by a stylus upon a smoked cylinder, but it is now known that its record was not autographic, although it conveyed a fair idea of the number and variety of air waves necessary to the production of words and sentences.

Faber's talking machine is curious and interesting on account of being a mechanical imitation of the vocal organs. It is capable of producing articulate speech by the manipulation of a bellows and key.

The first machine to really echo one's own words was the Edison phonograph, which, as originally presented, was not sufficiently effective in its operation to be of any great commercial value, although it contained the germ of the modern talking machine.

The graphophone, which is shown in the annexed engravings, is, as its name indicates, a recorder and reproducer of sounds. It is the invention of Mr. Charles Sumner Tainter, and is the result of several years' experimentation and the subject of many patents, several of which were issued in May, 1886. In its construction, efficiency has, of course, been the first consideration, after which the matters of simplicity, facility of management, and the practical handling of the records or messages have been disposed of.



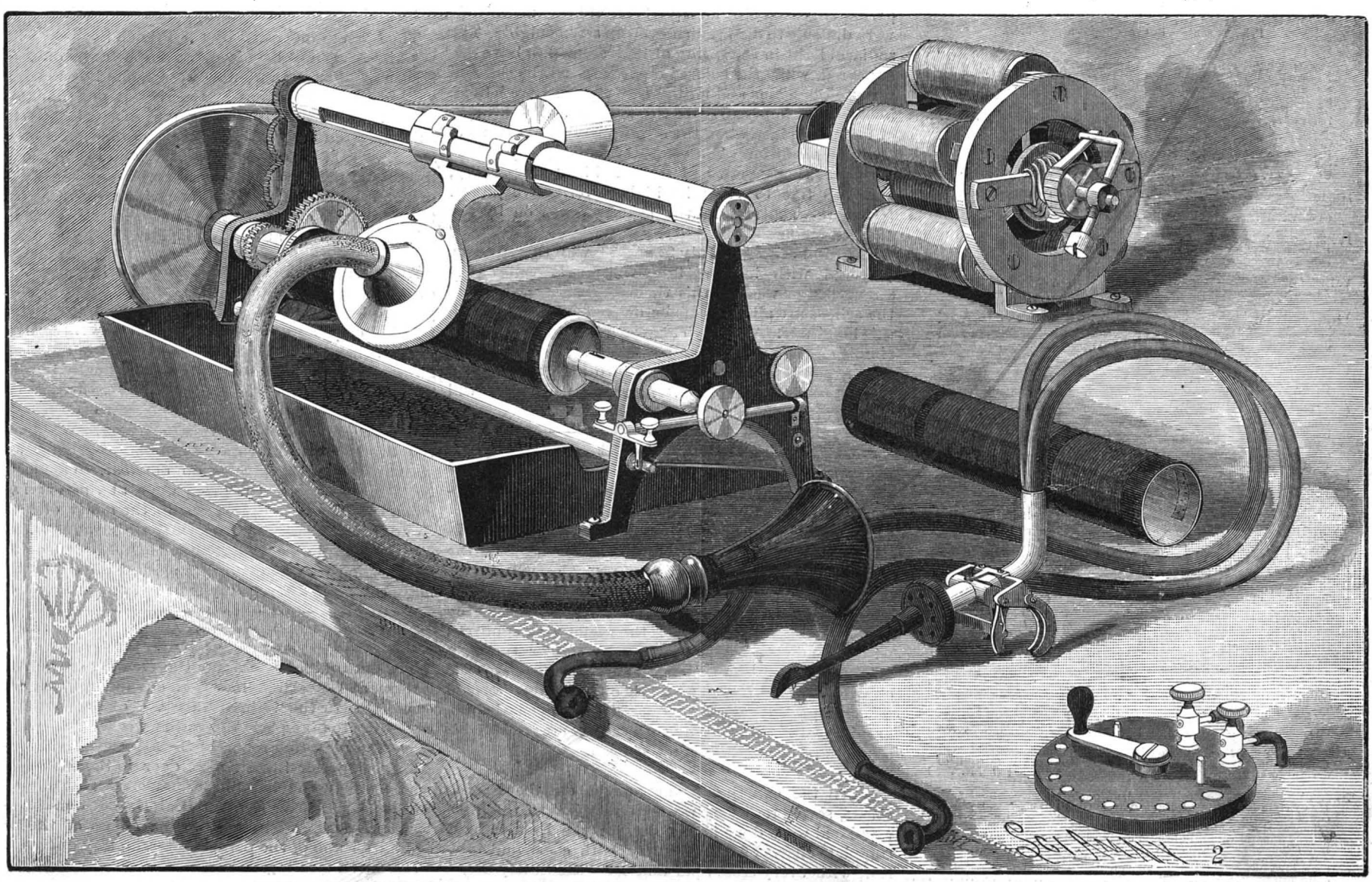
THE REPRODUCTION OF ARTICULATE SPEECH.

The machine is an exceedingly simple thing. The large illustration shows it as arranged for receiving or recording the message. Fig. 1 shows it as it appears while repeating or reproducing. The frame of the machine consists of end pieces connected by longitudinal rods. In the top of the frame is journaled a fine screw partly inclosed by a tube, the screw being driven through a train of spur wheels from the main shaft journaled in the lower part of the left hand end piece. The main shaft—besides carrying the gearing which moves the feed screw—is provided with a conical chuck. In the opposite end of the frame is journaled a spring-pressed spindle, which also carries a conical chuck of the same form and size as that on the main shaft. The cylinder upon which the speech is to be recorded is received between these chucks, as shown in Fig. 3, and in much the same manner as the bobbin is placed in the bobbin winder of the sewing machine, the cylinder being revolved by frictional contact with the chuck on the main shaft. At the right hand of the instrument is arranged a small rock shaft, provided with a cross arm and two keys by which the driving wheel is thrown into and out of connection with the gearing of the machine.

Upon the tube which incloses the feed screw is placed a saddle (Fig 4), provided with a follower which enters the slot of the tube and engages the feed screw. The saddle carries a diaphragm cell, in which is arranged a diaphragm provided with a cutting stylus which engraves the record in the surface of the cylinder.

To the diaphragm cell is attached a bar or bridge piece of metal, which extends across the face of the diaphragm, but not in contact with it. This device rests upon the record cylinder a little in advance of the cutting stylus, and supports the weight of the diaphragm cell and its attachments. The depth to which the stylus penetrates the surface of the cylinder is regulated and maintained by this arrangement, and as the bridge piece bears upon the cylinder near the point of cutting, the apparatus follows all the irregularities of the re-

(*Continued on page* 23.)



THE GRAPHOPHONE, MR. CHARLES SUMNER TAINTER'S NEW SPEECH RECORDER.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.

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NEW YORK, SATURDAY, JULY 14, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 654

For the Week Ending July 14, 1888.

Price 10 cents. For sale by all newsdealers.

THE CELESTIAL WORLD.

TOTAL ECLIPSE OF THE MOON.

The moon will be totally eclipsed on the 22d and 23d. The times of the phases are as follows:

	d.	h.	m.	
Moon enters penumbra	July 22	9	55·3	P.M.
Moon enters shadow.....	" 22	10	54·5	"
Total eclipse begins.....	" 22	11	53·4	"
Middle of the eclipse.....	" 23	0	44·6	A.M.
Total eclipse ends.....	" "	1	35·8	"
Moon leaves shadow.....	" "	2	34·6	"
Moon leaves penumbra	" "	3	33·7	"

The eclipse will be visible generally throughout North and South America, and in portions of Europe, Africa and the Pacific Ocean. It is a repetition of the eclipse of July 12, 1870. The magnitude of the eclipse is 1.825, the moon's diameter being 1.

The total eclipse of the moon of January 28 will be long remembered by observers who were fortunate enough to behold it under the cloudless sky and in the clear atmosphere that widely prevailed at the time. It was one of the most beautiful eclipses on record, and was especially noteworthy for the red, coppery color that revealed the presence of the eclipsed moon in the sky, when entirely immersed in the earth's dark shadow.

The totally eclipsed moon is plainly visible in the firmament in far the greater number of eclipses, the color of the disk varying from a copper hue to a deep, somber gray. The coloring is explained in this way: The sunlight grazing the earth's atmosphere is refracted into the earth's shadow, and the light on the moon is the result. If the atmosphere be pure and cloudless, the moon will present a reddish, coppery hue. If it be full of clouds and vapor, the moon will present a darker and more somber hue. If the earth had no atmosphere, the moon would be invisible during totality.

There are times, however, when the moon is not seen during totality. They are very rare, occurring at long intervals. Such was the case in the two total eclipses of 1884, the latest ones previous to that of January 28. The first of these eclipses took place on April 10, and was observed on the island of Java; the second took place on October 4, and was observed in Europe. The moon was invisible during totality in both instances.

What, then, made so wide a difference between the aspects of the moon in 1884 and 1888? The vapors and fogs pervading the earth's atmosphere would hardly account for the entire absence of light in the one case, nor would the clearer atmosphere fully account for the unusually brighter coloring in the other case.

An ingenious theory has been devised to solve the problem. The dust and vapor filling the atmosphere after the great eruption of Krakatoa, August 26, 1883, is made to account for the curious results in both eclipses. The disturbance in the atmosphere due to Krakatoa dust was manifest in various ways. It was difficult to find Venus in the day time when at her period of greatest brilliancy. Stars of lesser magnitude were difficult to distinguish even on serene nights. The zodiacal light in the spring of 1884 seemed to have disappeared, while the colored circles around the sun and the superb dawns and twilights of 1883–84 have left an ineffaceable impression on the memory. The eclipses of 1884 took place when the atmosphere was in its most troubled condition. The eclipse of January 28 occurred when the atmosphere had recovered its transparency, and was free to exert its highest refractive power. Hence the contrast in the aspects taken on by the eclipsed moon.

The total eclipse of July 22 and 23 will therefore be observed with intense interest, for it will either strengthen or weaken this theory. The conditions of the eclipse are all that can be desired for observers in this longitude. Totality commences when the moon is almost on the meridian, and continues 1 h. 43 m. The time from the moon's entrance into the shadow until she leaves it is 3 h. 40 m. A good opera glass will greatly aid in the observation.

MILITARY NOTES.

The French squadron, now gathering at Toulon for the regular summer evolutions, has with it an aerostatic corps charged with work of a wholly novel kind. Captive balloons are to be sent up from the ships to heights of 300 meters—about 1,000 feet—and, the weather permitting, still greater altitudes will be attained. As is customary when such ascensions are made from the land, a topographer will go up with the balloon to make a sketch of the underlying country; with special reference to roads and woods or the position of a supposititious enemy if the country is a hostile one, or if friendly, then to mark off on a regular field map his position with reference to the general topography of the country, giving a careful estimate of his strength as to numbers and situation.

When the experiments are made on the French coasts, severe tests may readily be applied to the topographical work done in the sky, for the French have complete charts of their country, both coast and interior, with every cross road and lane accurately determined and laid down, every hill measured, and indeed the position of every house recorded. The topographer in the balloon, however well he can see, must guess as to the effect of the light and color in the foreshortening of the picture beneath him, and at the amount of refraction.

Just now those who are to operate and work in the marine balloons are at practice at Chalais-Meudon, where an aerostatic station was some time ago established. Referring to this practice, *L'Avenir Militaire* says it is quite remarkable the improvement which a really good topographer will make as his eye gradually adjusts itself to the measurement of a diminishing landscape; his work coming nearer and nearer to the original as laid down on the military chart as his experiments continue, for he is allowed, after descending with his sketch, to compare the apparent with the real by the aid of the military map, thus learning where the inclination to magnify or curtail is most pronounced.

It was promised for the new Lebel (French) repeating rifle that it was humane, either killing outright or disabling, but not torturing with the frightful wounds made by single-firers of large caliber, and indeed, so far as known, the magazine guns as well. Recent experiments, however, have shown that the 8 millimeter Lebel magazine gun is no more humane than that of 11 millimeter caliber.

The experiments were conducted by Captain Jaricot, his men firing into dead bodies and at live animals at distances of 200, 400, 600, 1,000, 1,400, 1,600, and 2,000 meters, and the results as summed up by Dr. Delorme are that the orifice made by the entrance of the 8 millimeter ball is smaller than that of its going out, the same varying from 4 to 6 millimeters, according to the velocity of the bullets—the power of the new steel projectile being greater than that of its predecessor, the bones offering less resistance, and there being consequently less deflection of the bullets. The hope that the bones would have a "clear" fracture, with little of the splintering which is so painful, has not been realized. On the contrary, the bone is torn—"shivered" would, perhaps, more nearly express what Dr. Delorme says in the article he writes on *Chirurgie de Guerre*. And yet he says that the effects of the new rifle, as used at present, are trifling compared to what they will be when the new explosives, melinite, roburite, etc., are used.

The readers of the SCIENTIFIC AMERICAN will readily understand the truth of this by recalling the dreadful scenes witnessed at the arsenal at Belfort, March 10, 1887, which were described in these columns; 17 men were killed on that day by the premature explosion of a melinite shell, the bodies being so mangled as to be in most cases unrecognizable, those parts of the skin remaining being tattooed as if they had been covered with minute particles of powder, with grains exploding the one after the other.

The scheme suggested by the French Society Colombophile is a novel, indeed, an important, one, and it seems rather strange, now we are told how much advantage is likely to result, that it was not thought of before. It consists in sending pigeon messengers from ship to ship, the same being on the broad seas and far apart, or near an enemy's country, and needing re-enforcement. A cote has been established aboard the dispatch boat St. Louis, the consort and constant attendant upon the Couronne, line-of-battle ship and school of gunnery at Salius-d'Hyères.

At its recent departure from Toulon, whither it comes every three weeks to revictual, the St. Louis brought young pigeons, which quickly got accustomed to their floating cote, and to the noise of artillery fire, the St. Louis firing at least 600 shots a week from her great guns. At distances small at first, but finally reaching 200 miles at sea, the pigeons were released with messages, those of the St. Louis going to their home cote on the Couronne, and those in the latter flying to the St. Louis. There have been few mishaps, and, strangest of all, the pigeons do not fear, so far as can be seen, the fire of the great guns, at times arriving when they are in full play, and in the midst of heavy clouds of smoke coming from the burning powder. The idea is to keep up constant intercourse between distant fleets which may be operating against an enemy that may appear in force at any moment, and at any point.

Meeting of the American Association for the Advancement of Science, for 1888.

The date of August 22, for the meeting of the Association, at Cleveland, has been changed by the local committee to the 15th, on account of another great gathering to take place there that week. The special office and reception rooms of the Association will be at No. 407 Superior Street, next door to the Hollenden, where will be the hotel headquarters. The meetings will be held at the Central High School building, on Wilson Avenue, where will be the offices of the local committee and of the permanent secretary during the week of the meeting.

Roland Duer Irving.

Prof. Irving, of the University of Wisconsin, died suddenly of paralysis at Madison, Wis., on the 30th of May. Mr. Irving had won for himself the reputation of one of the world's best geologists by his elaborate memoirs as geologist of Wisconsin, and also of the United States Geological Survey, on the archæan and copper-bearing rocks of Wisconsin and the adjoining regions about Lake Superior, and much was expected of him in the continuation of his labors. He was born in New York on the 27th of April, 1847, and therefore had passed but a few days beyond his forty-first birthday. He graduated in 1869 at the Columbia College School of Mines as a mining engineer, and ten years later the institution conferred on him the title of doctor of philosophy. In 1870 he entered on his duties as professor of geology, mining, and metallurgy in the University of Wisconsin, a position which he held until his death. From 1880 to 1882 he was one of the United States census experts.

The new geological survey of Wisconsin, authorized by the State in 1873, included Prof. Irving among its geologists. He had previously begun his study of the rocks, and in February of 1872 published the first of his papers on the subject that appear in this journal. The results of his further labors in the study of the minerals, rocks, and geology of the State occupy a large part of the several volumes of final reports published between 1877 and 1883; and they all bear the marks of careful, conscientious work by one who was thoroughly prepared for the difficult problems before him. His State work, supplemented by additional investigations in 1882, when he was put in charge of the Lake Superior division of the United States Geological Survey, was the basis of his volume on the copper-bearing rocks of Lake Superior, published by the Survey in 1883, and also of other memoirs on the archæan rocks which were preliminary to a full report that remains unfinished. He had selected assistants for the present season but a few days before his death. His paper on the Huronian, in vol. xxxiv. (1887) of this journal, is, we believe, his last publication.—*Amer. Jour. Science.*

Richard Trevethick.

HONOR TO THE MEMORY OF A GREAT INVENTOR.

A meeting of the subscribers to the Trevethick memorial was recently held, by permission of the Dean and Chapter of Westminster, in the Jerusalem Chamber, in order that the memorial window which has been placed in Westminster Abbey might be inspected. The Dean of Westminster presided, and among those present were Sir George B. Bruce (President of the Institute of Civil Engineers), Sir Charles Hutton Gregory, Mr. Frederick Trevethick, Mr. Hyde Clark, Mr. E. A. Couper, Mr. Joseph Tomlinson, Mr. T. Price Williams, Mr. C. T. Taite, and Lieutenant-Colonel John Davis (secretary of the memorial committee).

The Dean of Westminster, in opening the proceedings, said that when the subject was first suggested to him he was, like the great majority of the outside public, ignorant of the very great claims which he had since learned Richard Trevethick possessed to be placed among the worthies of England. He was greatly struck with the astonishing inventive fertility of the man and with the remarkable fact that he had anticipated advances in applied science associated with the names of engineers more familiar to the world. He had had very great pleasure in acceding to the request for a memorial window in the Abbey.

Sir George Bruce, after thanking the dean for his kindly interest in the movement, said that the proposal for a memorial to Trevethick originated in a feeling, very general among engineers, that his name ought to be lifted out of the oblivion in which it had lain during the fifty-five years since the great engineer's death. Trevethick had died absolutely penniless, and had been buried by the kindly charity of those who had known him best. The mark of deepest effect which Trevethick had made upon the engineering world was the introduction and application of high-pressure steam. He had begun very early with the idea of applying a pressure of 150 lb. per square inch, a plan which had only very recently been introduced into ocean steamboats. Moreover, Trevethick was undoubtedly the first man to make a locomotive to run on rails or common roads; he invented the dredging machine so much employed in our rivers and harbors; he had made improvements in the form and make of boilers absolutely necessary for bringing to anything like perfection the engineering applicances in the use of steam; and he had invented a thrashing machine. He seemed, in fact, to possess a marvelous instinct which enabled him to foreshadow almost all that was to be done in engineering from his day down to the present; he had, for instance, actually patented the application of the screw instead of paddles for driving steamboats.

Sir Charles Hutton Gregory, who also thanked the dean for his assistance to the movement, said that it was a matter of satisfaction to the committee to find how much the name of Trevethick had been honored by working men.

Mr. Frederick Trevethick, as the only surviving son of Richard Trevethick, thanked the Dean of Westminster, the committee, and the subscribers for their recognition of his father's services to the country. His father, a few days before his death, had written, "The great honor of having been a useful subject can never be taken from me, and that to me exceeds all riches."

The Dean of Westminster then invited those present to inspect the window, which, he said, had been executed with great care, and with the advantage of the Archbishop of Canterbury's advice.

The memorial window is situated in the north aisle of the nave and is the third from the west end, being next to that in memory of Brunel. It consists of two finely proportioned lancets, with a quatre-foil shaped piece of tracery above. In the painted glass eight figures of early Cornish saints are represented, standing in two tiers of canopied niches, the name of each figure being written on a scroll beneath. A third row of niches below has figures of angels holding on scrolls outline drawings of some of Trevethick's inventions—namely, the locomotive which ran on the experimental railway in 1803, the locomotive of 1808, the steam dredger patented in 1803, and a Cornish engine and boiler. A figure of the Archangel Michael is placed in the piece of tracery, and in the canopies at the head of the lights are shields with the arms of the See and Duchy of Cornwall.

The amount of subscriptions at present received is $9,300, and of this sum a balance of about $4,000 remains over the cost of erecting the memorial window. With the balance it is proposed to endow an engineering scholarship in Owens College, Manchester, and also to institute a triennial medal at the Institution of Civil Engineers. To carry out these proposals, however, a further sum of £83 will be required.

The Trans-Caspian Railway.

The consul of the United States at St. Petersburg, Mr. Lothrop, says:

On the 27th of May, being the anniversary of the coronation of the Emperor, Alexander III., the Trans-Caspian Railway was opened formally to Samarcand with great ceremony—an event of no common importance to Russia, and even to the world. This road is 1,350 versts in length (about 900 miles), and is primarily a military road. It has been built and is controlled and operated by the Ministry of War. At present it is little more than a skeleton road. It is deficient in stations and rolling stock. But the great fact is accomplished. It opens the door into the great field of Central Asia. All things requisite to its efficiency will in time be added unto it. Though a military road, its political, economical, and commercial uses and results will not be inconsiderable. It brings Russia nearer to its coveted cotton fields, from which so much is hoped. It has already set in active motion measures for the restoration of the old magnificent system of irrigation, which has fallen into dilapidation and disease. One of the old irrigating canals is said to have been 100 miles in length. All successful cultivation of this region is dependent on irrigation, and a great increase in the production of cotton seems to be confidently expected. The importation of cotton into Russia in 1887 is said to have been 360,000,000 pounds, costing 96,000,000 rubles, and constituting 30 per cent of the entire imports of the empire. And it is mentioned with great pleasure by the public prints that the production of cotton in Turkestan rose last year to 18,000,000 pounds, being double that of any previous year.

It must not be supposed that the Trans-Caspian Railway is likely to rest at Samarcand. Beyond lie Taschkent, Ferghana, and Semiretch, which the Russian journals describe as the richest provinces in Central Asia, abounding in water, inviting colonization and culture. As these lie in the direct path of the interest and the ambition of Russia, the early extension of the railway may be confidently anticipated.

At the same time the project of the construction of the great continental railway across Siberia to the Pacific is agitated with increased intent. It is said that explorations of the line will be begun this year. It hardly seems probable that the available resources of the empire will permit the rapid prosecution of this gigantic undertaking, but it is a work which is necessary to the security and welfare of the Pacific possessions of Russia. Its construction, therefore, is only a question of time.

M. SCOLA has been trying a variety of experimental stains for the glass of dark-room windows, and has fixed upon the following formula:

Water	100 c. c.
Gelatine	5 grammes.
Nitrate of silver	1 gramme.

Glass coated with this solution is exposed to light until it assumes a reddish brown tint. It is then washed to eliminate the nitrate of silver. A surface is thus obtained through which the actinic rays do not pass. The coloration may be deepened by increasing the proportion of nitrate of silver up to three or even four grammes. Glass tinted in this way may also be used to shade the dark-room lantern.

Iron and Steel Production.

The United States and Great Britain produced last year three-fourths of the steel and two-thirds of the iron made and consumed among enlightened nations. The pig iron output was 20,820,771 tons, of which Great Britain produced 7,441,927 tons and the United States 6,417,148 tons, Germany standing third on the list with a trifle more than one-half as much as was produced in the United States. The total increase in iron output over the preceding year was nearly 2,000,000 tons, all the iron-producing nations, except Austro-Hungary, increasing their output. The steel product for 1887 was 8,462,390 tons, an increase of 765,374 tons over the previous year. In steel and steel rail production the United States took the lead, Great Britain coming next, and the combined production of the two countries reaching three-fourths of the total product. The increase in iron and steel production in 1887 over the previous year was marked, but much greater in the United States than elsewhere. The increase in iron output outside of the United States was 8·8 per cent, and in the United States 12·9 per cent. The increased production of foreign steel was 26 per cent and of American steel 31 per cent.—*Phila. Times.*

The Electric Resistance of Copper at Low Temperatures.

A contribution to this subject has just been made by M. Wroblewski, who undertook to test the truth of Clausius' remark in 1856 that the electric resistance of chemically pure metals should be proportional to their absolute temperature. That is to say, if the temperature of a metal could be reduced to the absolute zero, its resistance would be annihilated and its conductivity increase to infinity.

M. Wroblewski, taking advantage of one of the new methods of producing intense cold, namely, that by means of boiling nitrogen at the temperature of its solidification, wires of copper about 4-100 millimeters in diameter and covered with a double layer of silk were taken; their conductivity being guaranteed by the makers as 98 per cent of that of pure copper. With this wire M. Wroblewski wound small bobbins having a resistance at ordinary temperatures of between 3 and 20 Siemens units. As the bobbin had to be plunged in liquefied gas, M. Wroblewski began his investigation by studying the electric properties of liquid oxygen and nitrogen. He found that these substances ought to be ranked among the most perfect insulators. The resistances of the bobbins were then measured by the Wheatstone-Kirchhoff method at the temperature of boiling water; ordinary temperature; the temperature of melting ice; the temperature of boiling ethylene at atmospheric pressure (— 103 deg. Cent.); the critical temperature of nitrogen (— 146 deg. Cent.); the temperature of boiling nitrogen under atmospheric pressure (— 193 deg. Cent.); and a temperature nearly that of the solidification of nitrogen (— 200 deg. Cent. to — 202 deg. Cent.). The results are embodied in the following table, where t is the temperature, r the resistance in Siemens units, and a the coefficient of variation of resistance between two consecutive temperatures:

Bobbin I.			Bobbin II.		
t. deg. C.	r.	a.	t. deg. C.	r.	a.
—100	5·174	....	+ 23·75	19·251	
— 21·4	3·934	0·004365	+ 23·75	17·559	0·004057
± 21·4	3·614	0·004136	—103	9·848	0·004263
—103	2·073	0·00414	—146	6·749	0·004104
—146	1·360	0·004588	—193	2·731	0·004869
—193	0·580	0·004592	—201	1·651	0·007688
—200	0·414	0·006562			

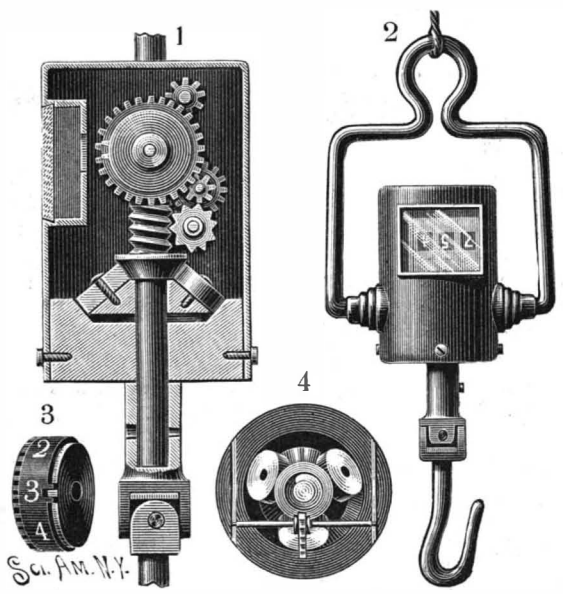
These numbers seem to show that the resistance decreases much more quickly than the absolute temperature of the specimens, and approaches *nil* at a temperature not very far from that obtained by evaporating liquid nitrogen in a vacuum.

Whistling Speech.

At the last meeting of the Berlin Anthropological Society, Lieutenant Quedenfeldt, a German officer who has lived on Gomero Island, one of the Canary group, described a whistling language which is used by the inhabitants. The language does not consist of any arbitrary series of signals or sounds. It is described as ordinary speech translated into articulate whistling, each syllable having its own appropriate tone. The Gomero uses both fingers and lips when whistling, and Lieutenant Quedenfelt asserts that he can carry on a conversation with a neighbor a mile off, who perfectly understands all he is saying. The practice is confined to Gomero Island, and is quite unknown to the other islands of the archipelago. The adoption of the whistling language is said to be due to the peculiar geographical construction of Gomero Island. It is traversed by numerous gullies and deep ravines, running out in all directions from the central plateau. As they are not bridged they can only be crossed with great difficulty; hence a man living within a stone's throw of another in a straight line has often to go many miles when he wishes to see and speak to his neighbor. This, it is conjectured, led to the adoption of whistling as a useful means of communication, which has gradually assumed the proportions of a true substitute for speech. —*St. James's Gazette.*

AN IMPROVED SHIP'S LOG.

A device whereby the distance sailed or steamed by a vessel in a given time will be recorded in knots, and the record will be open to inspection at all times, has been patented by Captain Oscar Kustel, and is illustrated herewith, Fig. 1 showing a vertical central section, and Fig. 2 a side elevation. Its mechanism is contained in a cylindrical casing, to be made fast with a line to the taffrail of a vessel, or extended from the side of the ship by a pole, a line extended from the hook at the lower end into the water carrying a rotator, which turns fast or slow according to the speed of the vessel, communicating motion to the mechanism of the log, as the hook is revolved, through a shaft extending upwardly into the casing. An inverted U-shaped frame is held by a centrally apertured disk in the lower end of the casing, as shown in Fig. 1, the central aperture having an outwardly and upwardly inclined side wall, and an apertured conical wheel revolving upon the face wall of the recess, such wheel having three or more friction rollers upon its inclined sides, adapted to travel on the inclined side wall, as shown also in Fig. 4. The shaft vertically entering the casing at the bottom extends upward centrally through the disk and conical carrying wheel, and has an annular projection with beveled under surface adapted to engage the friction rollers, while above such projection it is provided with a worm, whereby its motion is communicated, through successive gear and pinion wheels, to the different registering wheels indicating the number of revolutions made or the distance sailed. By this construction, when strain is exerted upon the vertical shaft, the annular projection thereof, bearing on the friction rollers, forces them against the inclined wall forming their track in a straight line, or at right angles to their axes, in consequence of which there will be no strain on the pivots or axes of the rollers, and no friction or wear on the heads of the pivots, with a very slight amount of sliding friction. In one side of the casing is an aperture covered by a glass pane, and having a series of rectangular recesses, through which the number of knots sailed, as indicated by the registering wheels, can at any time be read.

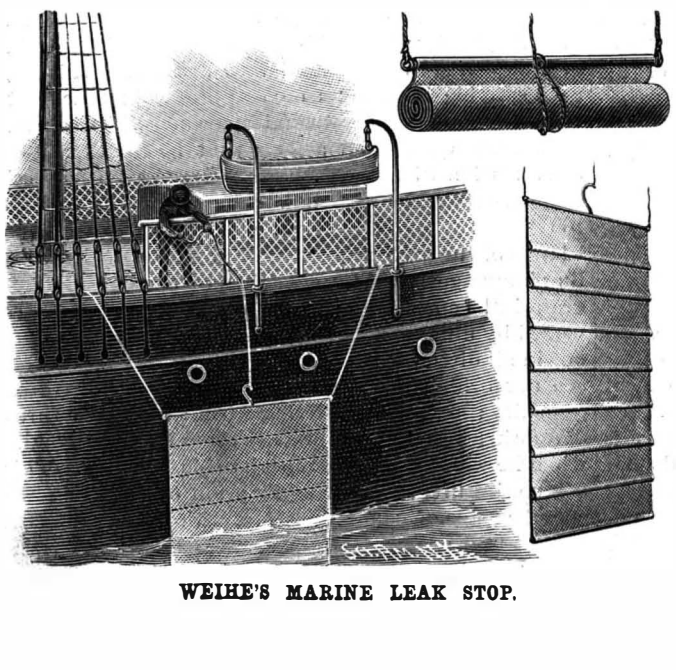


KUSTEL'S SHIP'S LOG.

For further particulars with reference to this invention address Captain Oscar Kustel, care of Mr. A. Nelson, corner East and Jackson Streets, San Francisco, Cal.

A DEVICE FOR STOPPING LEAKS IN VESSELS.

The accompanying illustration represents a device for stopping a bad leak in a vessel which has sustained injuries by collision or otherwise, endangering the vessel's sinking, with the loss of the lives of those on board. It is simple in construction and designed to be always quickly available for immediate use. It consists of a canvas sheet stiffened horizontally with iron bars of such diameter and spaced at such distance apart as the draught and other conditions of the vessel may make most expedient. To each end of the upper stay rod is attached a rope by means of which the device is suspended over the side of the vessel when it is brought into service, and to the middle of the upper stay rod is suspended a hook, in the point of which a rope is also made fast. This hook is adapted to support the rolled-up sheet, the rope, as attached to the point of the hook, to be used for releasing the canvas sheet roll, and permit it to unroll downward and cover the break. When a vessel has a hole stove into her, the leak stop is suspended over the side of the vessel directly above the hole and the side lines are made fast on deck, while the middle line is left slack until the hole is definitely located and the leak stop is properly suspended. Then the middle line is hauled taut and made fast, and the side lines are gently slacked to let all the weight come on the middle line, when the hook will drop out and the canvas sheet unroll down and cover the break, the inflow carrying the sheet against the vessel's side and stopping the leak.

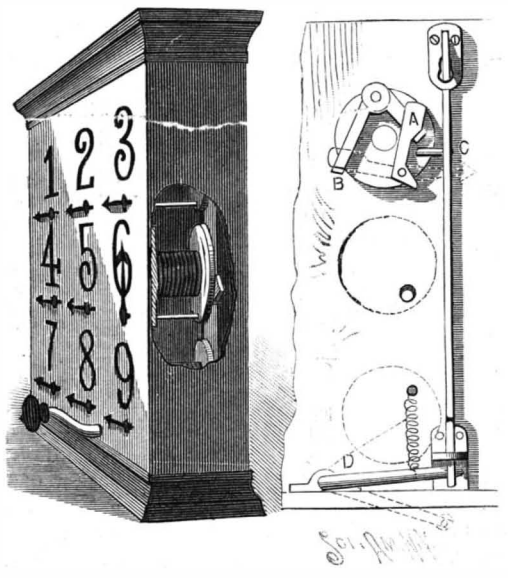


WEIHE'S MARINE LEAK STOP.

This invention has been patented by Mr. Louis Weihe, of Connellsville, Pa.

AN IMPROVED ELECTRICAL ANNUNCIATOR.

An annunciator which is designed to be simple, inexpensive, and efficient is illustrated herewith, and has been patented by Mr. Hiram S. Downerd, of Zanesville, Ohio. Its face has the usual series of figures or characters, beneath each of which is an aperture, through which projects a spindle carrying an index, this spindle being received in apertures in the rims or heads of an electro-magnet, beyond the winding, the magnet being placed directly behind the figure or character. The spindle is located below and a short distance to one side of the iron core of the magnet, and to its rear end is attached an armature having an obliquely projecting finger on its lower end. To the rear heads of the magnet are attached arms of non-magnetic material, with their ends bent rearwardly to form stops, A B, limiting the motion of the armature, and at the side of each magnet is a vertical bar, arranged to move in guides carrying a finger, C, adapted to engage the obliquely projecting finger on the lower end of the armature. The annunciator has as many magnets and associated parts as there are figures or characters upon its face, and for each vertical row of magnets there will be a bar with fingers for engaging each armature, these bars being all connected together, if desired to be moved simultaneously. When a current is sent through the magnet, its magnetized core attracts the armature, causing it to leave its stop, A, and move forward past the center of gravity, dropping, when the core becomes demagnetized by the breaking of the circuit, upon the stop, B, as shown in dotted lines. The armature in dropping turns the spindle, carrying the index through a quarter of a revolution, raising the index to a vertical position in front of the figure or character on the face of the annunciator. To return the armature and the index to the point of starting, the arm, D, projecting through the front of the annunciator, is pushed down, thereby drawing down the vertical bar and bringing the finger, C, into engagement with the obliquely projecting finger on the lower end of the armature, thus throwing the armature over against the stop, A, where it remains by its own gravity.

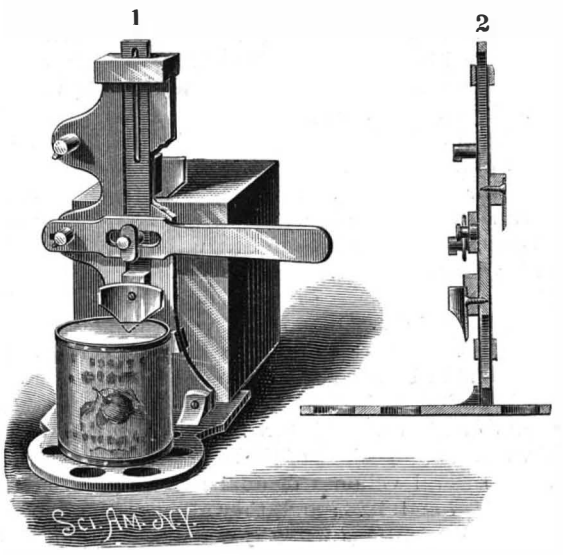


DOWNERD'S ELECTRICAL ANNUNCIATOR.

HOW SCIENCE ADVANCES.—"He who wishes to keep abreast with the march of science today must leave the college and go to the workshop, and into the dark corners of private laboratories, for investigators rarely have time to write, so that text books are years behind the science itself."—*Prof. Elisha Gray.*

AN IMPROVED CAN OPENER.

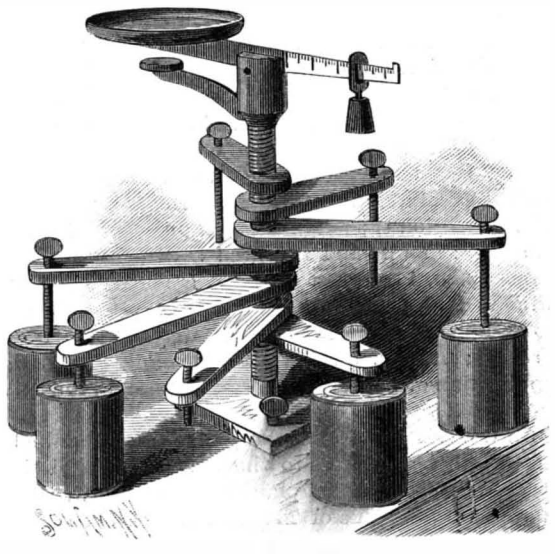
A simple and compact device, whereby a round or square preserving can may be neatly and quickly opened, and so as to leave only a slight margin around the opened top of the can, has been patented by Mr. Jared Blakeslee, of Story City, Iowa, and is illustrated herewith, Fig. 1 showing the device with both a round and a square can in position for operating upon, while Fig. 2 exhibits it in cross sectional elevation. The base has a front round portion for round cans and a rear rectangular portion for straight-sided cans, there being a fixed standard with a vertical slot forming guides in which slides a bar or carrier, on the front of which is fixed a stepped block with concave vertical face, to which may be readily attached a curved and pointed knife or cutter. To the rear of the carrier is also fixed a stepped and straight-faced block for the attachment of a flat-pointed cutter, adapted for use in opening straight-sided cans. A transverse handled lever is pivoted on one of two fixed studs at one side of the carrier guides, and a slot in this lever engages a pin projecting from the face of the carrier, this arrangement giving opportunity for considerable range for the cutters for operating upon cans of varying height, which, when placed upon the proper seat of the base, can be readily cut open as closely to the side as desired by properly working the lever.



BLAKESLEE'S CAN OPENER.

A CLAMP FOR HOLDING COVERS ON FRUIT CANS.

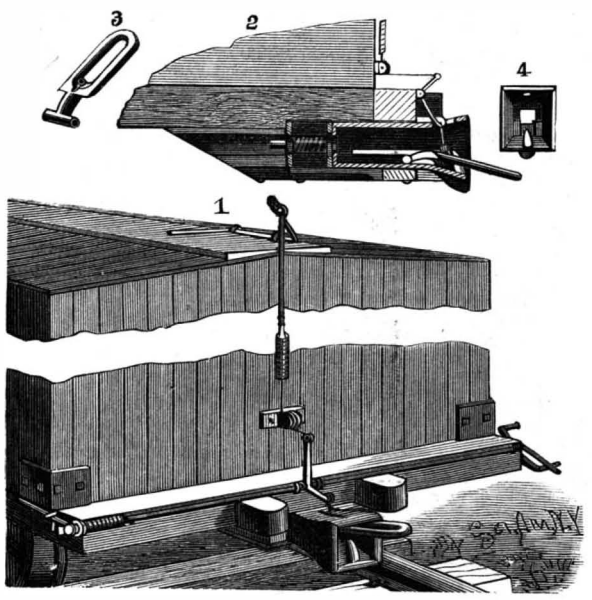
A device to be employed in putting up fruit in cans, having clamps for holding the covers in place until the wax used in sealing has cooled and hardened, and a scale for weighing the fruit and sugar to be put up, is illustrated herewith, and has been patented by Mrs. Mary J. Hamlin, of Bartramville, Ohio. It consists of an upright standard, with a suitable base, which can be easily set up by screws in the base in any convenient place, the upper end of the standard having a head in which is pivoted a weighing scale, while upon the standard is formed a screw thread on which are mounted any number of lateral arms, which may be raised or lowered upon the upright by turning them about on the screw thread. The outer ends of the arms have set screws to be screwed down against the covers of the cans, which, as fast as they are filled with hot fruit, the covers put on, and the wax applied, are placed under the outer ends of these lowered arms, and the screws tightened against the covers, thereby excluding air and holding the covers in place until the wax has hardened. The set screws in the arms are of different lengths to allow for the different heights of the arms, whereby they may be used upon a number of cans set around the central standard.



HAMLIN'S CLAMP FOR FRUIT CANS.

AN IMPROVED CAR COUPLING.

A coupling which is designed to allow the cars to be coupled or uncoupled from either the side or the top of the car, and also to permit of the automatic uncoupling of cars for shunting them about the yard, etc., has been patented by Mr. Herbert S. McKague, and is illustrated herewith, Fig. 2 showing a longitudinal vertical section, and Fig. 3 representing the coupling link. The draw-



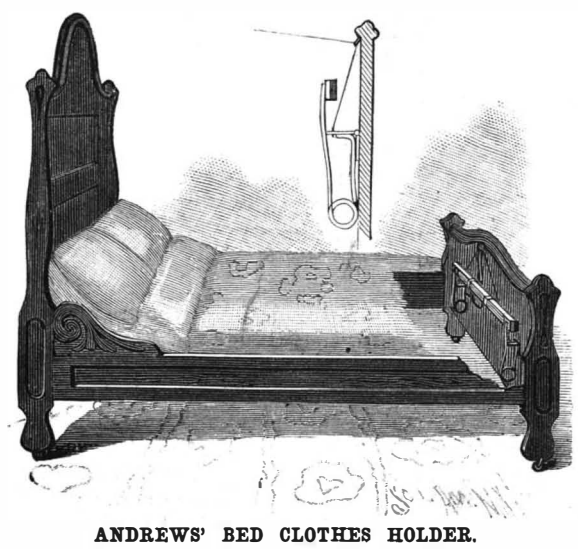
McKAGUE'S CAR COUPLING.

head is fitted to slide upon plates, and between beams fixed to the car frame, the plates also supporting buffer plates between which springs are held behind the drawhead. There is a large interior cavity or socket in the drawhead, more than deep enough to allow the coupling link to pass for its entire length into the socket, at each side of which is a flange fixed on the drawhead walls, a little distance from the floor of the socket, making grooves or ways adapted for the travel of a fixed cross bar on the rear end of the coupling link. At the forward ends of these grooves are shoulders, behind lugs or lateral projections having outer faces downwardly inclined to the sloping front face of the drawhead, to which is held a hook or horn, rounded over at its front face, up which the end of a coupling link held by an opposing car may ride, to drop behind the horn for coupling cars. When the link is pushed back far enough in the drawhead socket, the opposite ends of its cross bar will fall from and past the inner ends of the opposite flanges, and as the link is drawn forward the cross bar will ride along the ways until it bears on the shoulders at the forward ends of the ways to take the draught strain of hauling the cars. To lift the outer end of the link, for it to enter an opposing drawhead, and to allow the link to be forced clear back in the drawhead, the link is connected to a chain or cord passed through a slot at the top of the drawhead, and attached to the outer end of an arm fixed on a rock shaft journaled on the car body, which can be operated from either the top or side of the car. A spring is interposed in the connection leading to the operating lever at the top of the car, and also around one end of the rock shaft, whereby, in its operation by the handle at the side or from the top, it may be put under sufficient tension to facilitate the automatic making of a flying switch, the link then only being raised by the rock shaft, through its fixed arm and chain or cord connection, when the draught strain of the moving cars is relaxed.

For further particulars with reference to this invention address Mr. Herbert S. McKague, care of T. C. Hipple, Lock Haven, Pa.

A DEVICE FOR HOLDING BED CLOTHES IN POSITION.

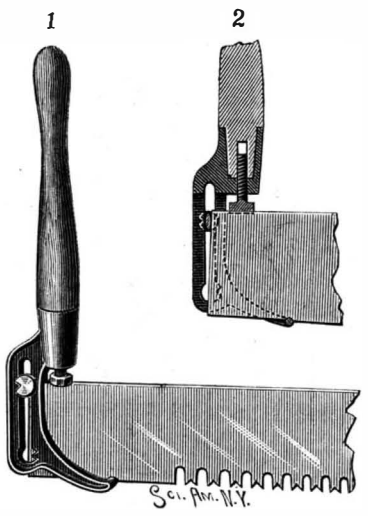
A holder adapted for convenient attachment to the footboard of a bedstead, so that when the bed is made the clothes will be effectually retained in position, and not be liable to be accidentally thrown off by the occupant, is illustrated herewith, and has been patented by Mr. G. Osgood Andrews, of No. 443 Greenwich Street, New York City. A plate is attached to the inner face of the footboard, near each end, in which a vertically swinging spring-held latch bar is pivoted, and longitudinally upon each plate is secured one member of an essentially U-shaped spring, which is bent outwardly and upwardly to support the latch when in horizontal position. The other members of the springs extend upward beyond the plates, being attached to the ends of a clamping bar extending along the footboard, and provided with corrugated rubber upon its outer or contact side, which prevents the wear of the bed clothes from friction and also serves to retain them more firmly in position on the bed. The clamp bar has a central loop or hand grip, and a cord from each latch is passed through an eye or staple under the cap strip of the footboard. In operation, the mattress being in position, and the sheets, blankets, etc., having been placed so as to leave about four inches of covering at the bottom in excess of the length of the mattress, the clamp bar is pulled forward by its loop handle until the latches are in horizontal position, as shown in the sectional view. The covers are then placed in the space between the footboard and the clamp bar, the latter being then pushed forward slightly to relieve the latches, while with the other hand the cord is pulled to raise the latches from a horizontal position, when the springs act to force the bar in contact with the clothes, and securely hold them between the clamping bar and the footboard, the bed spread covering all and rendering the holder invisible.



ANDREWS' BED CLOTHES HOLDER.

A REMOVABLE HANDLE FOR CROSS-CUT SAWS.

An improved removable handle attachment for cross-cut saws, which is easily applied and will not bend or break the saw, is illustrated herewith, Fig. 2 showing the attachment in vertical section. The saw blade holder is preferably made in one piece, with a transverse slot, and with a tapering socket portion to receive a wooden handle. It has at the bottom a forward curved or inclined portion, vertically slotted nearly down to its point at right angles to the transverse slot, while the forward portion of the blade holder is also vertically slotted in line therewith. The bottom portion of the transverse slot has an enlarged circular opening to receive a wedging bolt adapted to slide in the transverse slot behind the saw, this circular opening having a projection of the size of a slot in one of the heads of the wedging bolt, whereby the latter may be entered to position. The handle socket has a screw-threaded portion in which is received a screw-threaded stop, its head having slots adapted to engage the upper edge of the saw blade, and the lower edge of the saw blade is notched to fit over the lower end of the inclined portion at the bottom of the attachment within the vertical slot. To secure the handle to the saw, the wedging piece or bolt is pushed to the upper end of the transverse slot, as shown in Fig. 1, when the saw blade is entered in the slot at right angles to the transverse slot, and the handle brought over until the upper edge of the blade rests in one of the slots in the head of the stop screwed into the handle socket. The wedging piece or bolt is then pushed down behind the saw blade, forcing its upper edge firmly against the stop in the handle socket. The stop in the handle is adjustable in its socket to adapt it to saw blades of different sizes.



BLEGEN'S SAW HANDLE ATTACHMENT.

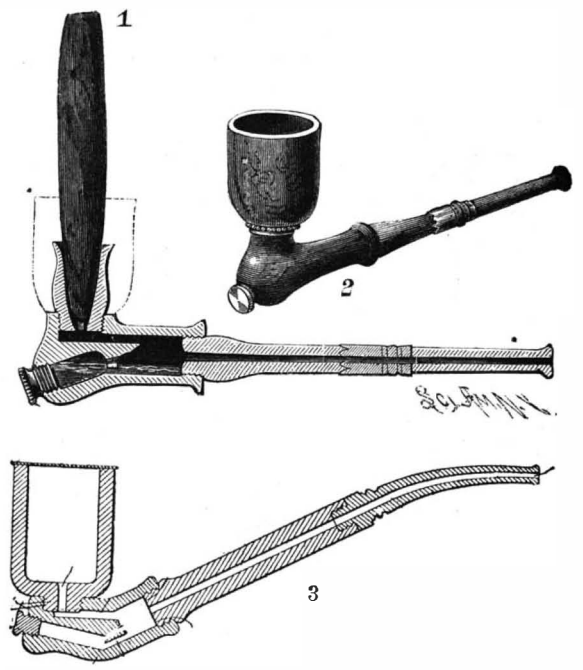
This invention has been patented by Mr. Lars T. Blegen, of Martell, Pierce County, Wis.

The Coming Naval Revolution.

The new 6 inch gun, throwing a 100 pound projectile and penetrating 13 inches of plating at 1,000 yards, is a gun of sufficient power to deal with almost anything built or building. It may fail to penetrate the strong patch, but it may knock any other part of the ship, and most of the men, to pieces. Mounted on the broadside, under armor, in a small port pierced in a turret which the gun itself rotates, training 120 degrees and firing eight rounds a minute, with a crew of three or four men only, and weighing but five or six tons, those we quote announce in their faces the death of the turret and the barbette.—*Broad Arrow.*

AN IMPROVED TOBACCO PIPE.

A pipe having a chamber to receive the moisture and oil precipitated in smoking, and in which a cigar holder may be substituted for the bowl, while it is so constructed that the moisture chamber may be



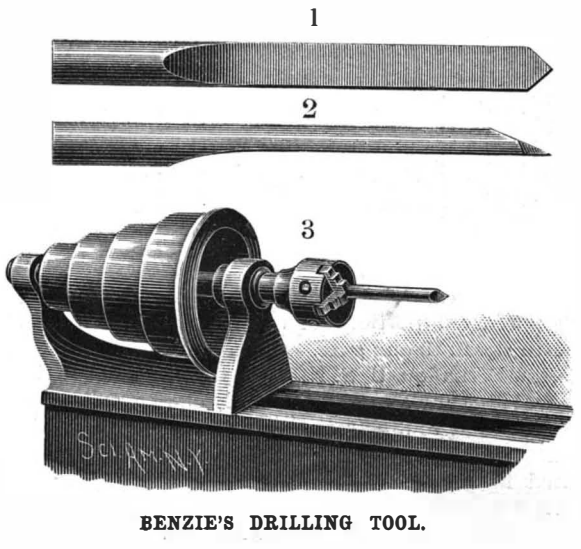
ROESLING'S TOBACCO PIPE.

cleansed without removing the stem, and the moisture will in no case re-enter the bowl or pass up the stem to the smoker's mouth, is illustrated herewith, and forms the subject of two patents issued to Mr. Frederich Roesling, of No. 398 North Perry Street, Cleveland, Ohio. The shank of the pipe is internally threaded at one end to receive the stem, an enlarged smoke chamber being immediately in advance of the stem opening. An upper smoke flue, leading to the smoke chamber from an aperture in the bottom of the bowl, has an enlarged portion immediately beneath the bowl, and the bottom portion of the smoke chamber opens by a narrow passage, as shown in Fig. 1, to a downward sloping reservoir, for the reception of moisture or nicotine, and closed on its outer end by a screw plug. In the form of pipe shown in Fig. 3 the reservoir is placed at a different angle, but in both cases any liquid therein is prevented from entering the stem by the shoulder thereof projecting into the smoke chamber, which is large enough to allow of the passage of moisture, etc., to the reservoir, without interfering with the free smoking of the pipe. The bowl, chamber, stem, and mouth-piece may readily be separately cleansed when desired, although in ordinary use it will be sufficient to simply remove the plug at the bottom of the reservoir and blow out the moisture.

AN IMPROVED DRILLING TOOL.

A simple and efficient tool, adapted for use on a lathe and in other ways, and which, while drilling a hole, will at the same time serve as a reamer to smoothly finish the hole, has been patented by Mr. Alexander Benzie, and is illustrated herewith. Figs. 1 and 2 show face and edge views of the tool, the working body being preferably milled to a semi-cylindrical form in cross section, to form two diametrically opposite and parallel longitudinal cutting edges, terminating at the outer ends with end cutting edges. The depressed surface between the longitudinal cutting edges may be concave or convex, instead of flat, the parallel reaming edges insuring a straight course for the tool, through which the drillings will pass freely, while the tool, if broken in boring, will loosen itself in the hole and can be readily removed therefrom.

For further particulars relative to this invention address Mr. Alexander Benzie, care of M. F. Kerrigan, No. 35 Willoughby Street, Brooklyn, N. Y.



BENZIE'S DRILLING TOOL.

COREA BY NATIVE ARTISTS.

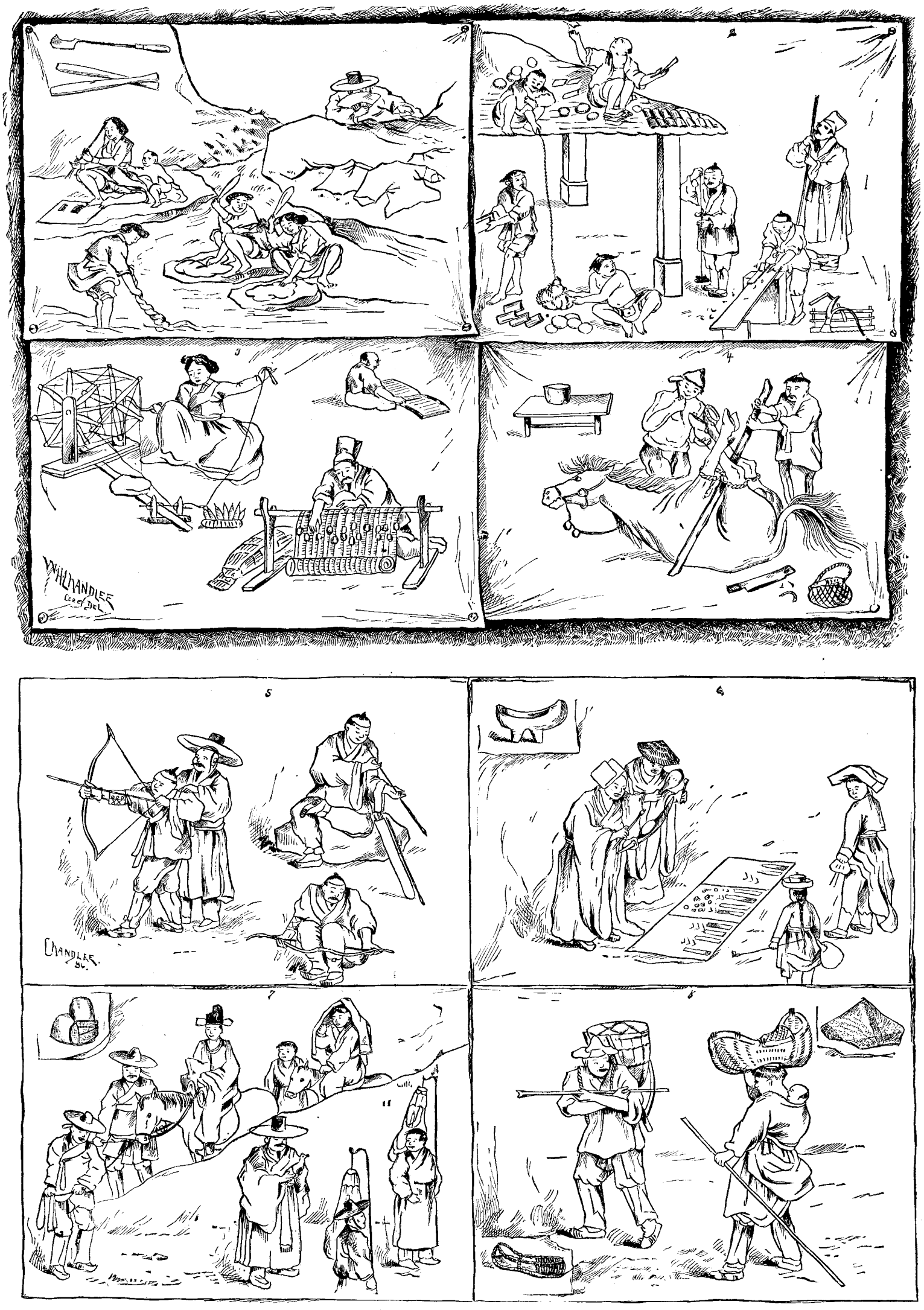
Mr. O. T. Mason, in his description of scenes in Corea, which the engravings are intended to represent, says that the testimony of recent explorers in Corea is to the effect that we have there a human exemplification of the survival of whole genera of industries and customs, while in surrounding regions these have been swept away or transformed. Half a dozen charming books on Corea, notably those of Griffis and Lowell, have portrayed portions of the inner life of a land hitherto closed to our gaze.

Ensign Bernadou, U. S. N., some time ago sent to the National Museum a small, but wisely chosen, collection of art products to illustrate social and industrial life in Corea. Among his specimens is a series of old screens painted in oil on silk, and depicting the paying of tribute by surrounding nations to the Emperor of China. An outer court is filled with attendants, beasts of burden, palanquins, and gifts in endless variety from every part of eastern Asia. Coreans, of course, hold a prominent place. A long procession of ambassadors from these various countries marches through massive gateways, along narrow courts, and over elevated bridges to the throne. There sit the reigning sovereign and his family, guarded by soldiers and attended by nobles. In front of the throne kneel the tribute bearers with their gifts. The faces, costumes, and postures are accurately drawn, but the perspective is thoroughly Chinese in the method of taking advantage of the whole space.

This work of art introduces us to the high life of Corea; but Ensign Bernadou also had the good fortune to obtain nearly a hundred old water color sketches by native artists, portraying industrial life and natural scenery. Eight of these paintings are presented in the accompanying plates. They are rather studies in real life than finished paintings, the latter usually partaking of the grotesqueness characteristic of both Chinese and Japanese.

Corean Women Washing Clothes (Fig. 1).—Women are not seen abroad, says Mr. Lowell, excepting servants at the wells and washerwomen. In Corea garments are taken apart to be washed, both the cleansing and the subsequent mangling being effected by means of clubs. When the garment is restored, the seams are pressed close with a very narrow smoothing iron.

House Builders at Work (Fig. 2).—Mr. Lowell also describes minutely the work of the joiner and the tiler. Hod carriers are unknown, and unnecessary, because the attendant can easily throw his tiles to the workman, while the balls of mud are passed up in netting. The "chalk line" is blackened with ink. Plane, saw, square, and adz are of the most primitive type. The presence of "the all-seeing eye" also seems necessary.



COREA BY NATIVE ARTISTS.

Spinning and Weaving (Fig. 3).—The textile practices of Corea exhibit the most primitive types of Chinese weaving. The loom for matting is very rude, although the work is excellent. The warp is held in place by a stone tied to the end of each thread. Half of these rest on one side and half on the other side of the upper beam. After the insertion of a weft straw, each of these stones is shifted to the opposite side.

Shoeing a Refractory Horse (Fig. 4).—The blacksmiths and other metal workers of Corea are quite clever. Some of their silver and copper inlaying done on jewelry boxes and furniture contrasts favorably with similar work by their neighbors. The bellows consists of a square box, in which a plunger of wood, packed with paper, passes up and down.

A Lesson in Archery (Fig. 5).—Archery is still a favorite amusement among the Coreans, and their soldiers are obliged to compete in yearly practice for prizes. Men of straw are set up in boats as marks. Great care is bestowed both on bows and arrows, and the junior members of the corps are carefully instructed in the precedents of practice.

Bonzes Selling Charms (Fig. 6).—Mr. Lowell characterizes Corea as a land devoid of religion, Confucianism swaying the upper classes and old superstitions the lower. Sorcerers and fortune tellers sell their charms to men and women, often parading them in public and announcing their presence with rude music. Mr. Griffis' "man of straw" plays an important part, even now being sold and kicked to pieces as a scapegoat for the man's former self. In the drawing of the sorcerer is exhibited the quaint custom among Corean women of wearing on the top of the head a garment which they may draw over the face on the appearance of a man.

A Wedding Procession (Fig. 7).—In the wedding procession we see the lantern men preceding; the bearer of a wild duck or goose or a model, symbol of domestic felicity; the happy bridegroom, seated on a horse led by a man and attended by another; last of all, the bride, attended by a young boy. Her garment, ready to cover her face on meeting a man, is characteristic, as well as the court dress and robe of the groom.

Peddlers on the Road (Fig. 8).—Peddlers are common throughout Corea. In our sketch are represented the methods of carrying loads and children, and the costume, hat, and shoes of the lower classes.

Each one of the paintings is as graphic and instructive as those presented. It is very difficult to impress upon the mind of ordinary travelers that it is just the information conveyed in such pictures that the anthropologists need. To write the life history of our practical arts, it is absolutely necessary to understand the minutiæ of industry in every stage.

It is clear that outside of the charm of the unknown, Corea is a distinctively interesting region. The views which we give herewith, and for the use of which we are indebted to the *Swiss Cross*, illustrate in some degree the quaintness of her people and their characteristic ways.

[THE SCIENTIST].

Bee Culture.

In the oldest writings mention is made of the bee, honey, and the honey comb, and a land flowing with milk and honey. From this we infer that the common honey bee has been known since the dawn of civilization, and that it is of Asiatic origin.

This insect has been the theme of many writers. Volumes have been and are being published, and there are journals devoted wholly to this subject.

Bee culture possesses a fascination peculiar to itself. The study of any other species of the animal kingdom cannot equal it. This is due, in a measure, to the many superstitions with which it was regarded. To-day, even, there are many people who believe that when a bee owner dies, some member of the family must communicate this intelligence to the bees by rapping on the hive. You will be interested in reading a poem by Whittier, entitled "Telling the Bees."

In the 18th century, Huber, a Swiss naturalist, who became blind at the age of fifteen, published many articles on the natural history of the honey bee. These writings are the first to tell the truth, and are quite remarkable, considering the way in which the experiments and observations were made.

If a prosperous colony be examined in June, there will be found three kinds of bees, viz., the queen, the workers, and the drones, also three kinds of cells. Two of these will be horizontal and hexagonal, and will differ in size only. The smaller is the worker cell, the larger the drone cell. The third cell is much larger than the others, and resembles an inverted cone with the opening at the apex. The different cells will be found to contain various substances—such as honey, pollen, eggs, and immature bees.

The queen is rightly named, for without her no colony can exist but for a short time. She is longer and more slender than the others, and is armed with a sting. The abdomen is quite tapering, and the wings short. She is the only perfect female in the hive, and during the height of the breeding season lays from two to three thousand eggs per day. This seems an exaggeration, but it does not equal the fecundity of the female of the white ant, which lays at the rate of sixty per minute. The queen has it in her power to lay drone or worker eggs. She will deposit in the worker cells the right eggs, and as it happens many times, the drone cells border these, but no mistake is made, for on examination no worker is found in a drone cell, but drones may be found in worker cells as was intended. This takes place when the apiarist removes all the drone cone, which gives no other place for the drone eggs. About ten days before swarming, eggs are laid in the queen cells, so that when the swarm issues a new ruler will be ready to take steps to carry on the work of the old. This work consists mainly of laying the eggs. The queen is much respected by the workers, a body guard of which encircles her. The food consists mostly of honey which is taken from the proboscides of the workers.

The worker bee, incorrectly called the neuter, is a female with ovaries imperfectly developed. It is smaller than the queen or drone, but has longer wings, is armed with a sting which it is ever ready to use in defense. The instrument is less than one-eighth of an inch in length, is hollow, and has two sacks at the base that contain poison. The sting is left in the wound, and the poisonous sacks and a portion of the intestines adhere to it. If the sting is removed from the wound immediately, little harm will result. Otherwise the muscles of the sacks contract and force all the poison into the system. When a bee loses its sting, it soon dies. Hornets, wasps, etc., do not have a barbed sting. They retain it, and can sting many times in a moment. Does it seem that the worker would be as ready to act on the defense if it knew what would be the result? The queen is quite different in this respect. She cannot be induced to sting except in mortal combat with another queen. The bystander will not interfere, and after a short conflict one falls a victim and the other becomes supreme ruler.

The hinder legs of the worker contain a spoon-shaped cavity or basket in which the pollen from the flowers is gathered, and a sticky substance called bee glue.

The worker is furnished with a tongue or proboscis, with which it takes the nectar from the flowers. Honey is gathered, not made. The honey is conveyed to the honey bag or first stomach. This receptacle is about the size of a pea, and is furnished with muscles which enable the bee to compress it and force the contents into the cell. When honey and pollen are abundant, a load of each is gathered. Less than twenty minutes are consumed in doing this. When gathering pollen but one kind of flowers is visited, else there would be considerable confusion in the vegetable world. During the busy season the worker has no rest, and, of course, wears out quite fast. At this time few live to be more than six weeks old. At other times they may live five months. An old bee can be distinguished from a young one by the ragged edges of the wings. In the abdomen of the worker are pouches or sacks for the secretion of wax, which is the fat of the bee. This can be formed or not, as occasion requires.

The drones are the male bees. They are longer and stouter than either the queen or workers, but their bodies are not so long as that of the queen. They are not armed with a sting and have no suitable proboscis for gathering honey from the flowers. There are no baskets on their thighs for holding bee bread, and no pouches on their abdomens for secreting wax. Many allusions are made about the drone because he is such a lazy fellow. He does what nature intended him to do, and that is all—to impregnate the young queens. Soon after this is accomplished the workers destroy them. This is done by biting and stinging. In this work the sting is not left in the wound.

The comb is made of wax, and consists of hexagonal cells of two sizes. The smaller are the worker, the larger, the drone cells. It has been found that no other arrangement will give an equal strength and volume with the same material.

The more we read and reflect on such subjects, the more we find

"Tongues in trees, books in running brooks,
Sermons in 'bees,' and 'God' in everything."

George H. Hastings.

When to Cut Hay.

The farmer seems to think that it is all very well for men to write about hay with the bloom on and an odor like southern breezes over a bed of violets, but when it comes to feeding the old cow he wants to see her chew on something that will keep her busy and will last awhile. The green-tinted hay stack melts before a herd of cows like a snow bank in a hot sun, while the dry old yellow article remains a monument of the hay field until the green grass makes its appearance once more. To be sure, the cows are somewhat thin, perhaps, and no profit has been made out of the cows in milk, but there has been no worry about buying ground feed or fodder corn to help carry the herd through the winter. Some men can suck consolation out of mighty dry substances.—*American Dairyman.*

Breaking in a Naval Cadet.

Within a few days the cadets shake easily into their places, and by going over the masthead every morning, sending up and down the light spars and being ordered to get a pull here and a pull there and a long pull altogether everywhere during the best part of their waking hours, they soon acquire a nautical air and a fairly good grip upon the strange surroundings. Two or three days later the Constellation drops down the Annapolis Roads, stands into Chesapeake Bay, and the long looked for cruise begins. Practical work commences at once, and if the winds be unfavorable—and they are usually—the ship beats down the bay in the daytime and anchors at sunset. Here the new cadet sees the envied senior class man in charge of the deck make and take in sail, tack, wear, boxhaul, and chapel ship, sees him occasionally miss stays and box her off, heave to, get casts of the deep sea lead, shift sails and spars, reef and shake out reefs, and bring the ship to an anchor. All this time he is doing yeoman's service himself, his hands get horny and hard, his white working clothes are tarry, and he is so used to "stamping and going it" that when night comes he is glad to turn in early and leave the hardships of anchor watch to those who have enjoyed the triumphs of the quarter deck.

After Hampton Roads are reached the vessel lies at anchor for a week or more, but this is a busy season, and all day long there are great gun company, pistol or small arm drills, fire quarters, boats armed and equipped, or that stirring exercise when the crew and cadets are called to "abandon ship." This drill is usually executed without previous warning, exactly as it might be needed in any sudden emergency, as in a collision or danger of foundering on the high sea; but within a moment after the order rings out every one is at his station, some lower the boats, others stand sentry over the falls, so no unauthorized or panic-stricken person may enter without orders, the majority pass up provisions and water, cooking utensils, arms, ammunition, and nautical instruments, there is heard everywhere the rush of feet, the whimper of boat falls as the davits creak and complain with the strain and the weight of the crews lowering themselves by stopper or halyards, from every gun port willing hands pass stores into the cutters, and when ready each reports its name and number. In less than five minutes, if the discipline be good, the crew is embarked in cutters, whale boats, launches, gig, and dingey, all submerged almost to their gunwales, and the ship is abandoned officially.—*Lieut. Kelley, in Harper's Magazine for July.*

Flour Yields.

We have before us a half dozen daily reports, taken at random from the files of a merchant mill, one of which we reproduce, to show the form in which such a record may be kept. It is as follows:

DAILY RECORD, MAY 1, 1888.

Twenty-four hours' run.

846	barrels	Patent	66·82	per cent.
342	"	Bakers'	27·01	" "
41	"	Low Grade	3·24	" "
37	"	Red Dog	2·93	" "
1,266	"	Total	100	" "
46,400	pounds	bran or	36·65	pounds per barrel.
29,200	"	middlings, or	23·06	" "
75,600	"	Total, or	59·71	" "

5,501 bushels wheat used.
4 bushels, 20¾ pounds yield per barrel.
31,019 pounds of coal used, or 24½ pounds per barrel.

While a record in precisely this form might not suit the conditions of every mill, there is no question but it would pay every merchant mill, no matter whether large or small, to keep a regular daily record of similar character. Where the wheat supply of the mill is drawn from various sources and the grades and quality differ, the record could be made more complete by noting on it not only the amount of wheat ground, but also the amount and character of the grades of wheat used each day. In the half dozen reports at hand, the yield varies from 4·18 to 4·22, which is explained by the varying quality of the wheat ground. A set of reports of this character, made out on cards and filed away, or entered in a book kept for the purpose, would not add any to the expense of the mill's bookkeeping and would be most valuable for reference and as a constant guide by which to check up the commercial operation of the mill.

No matter upon what system the mill is operated, whether long or short, a difference of a few pounds in the yield per barrel will work either for or against the profit balance with steady regularity.

It may seem needless to figure up the record every day, but if the miller knows exactly what his mill did yesterday, he will be better able to make it do as good work to-day, and more certain of making it do good work to-morrow.

The mill from which the report is received is probably doing as well as any mill which is running under similar conditions, and it is safe to conclude that the average mill does not get much, if any, over 70 per cent of flour out of the wheat it grinds.—*Milling Engineer.*

Deceptive Senses.

The senses are subject to illusions in proportion to the remoteness of the information that they give from the immediate necessities of the organism. Touch, the most immediate and least inferential of the senses, is least subject to illusions, while sight is so very much so that the blind often say they have an advantage over the seeing in being free from visual illusions. The illusions of bodily motion are much nearer to those of touch than to those of sight, and yet they can under certain conditions be induced through visual impressions. Of this the writer has recently had two interesting examples. He was standing upon the floor of a railroad depot, the boards of which were laid with a considerable open space between them, and the shadow of an electric light was moving up and down by the swinging of the light in the wind. Looking at the floor, it seemed as though the shadow were stationary, and the floor boards moving. From this it followed that the person on it was moving too, and the writer distinctly felt the swinging sensation, in fact his attention was called to the phenomenon by this feeling of motion. The other observation was as follows: While riding in the cars and looking out of the window, the trees and all are seen to move in the opposite direction. If, now, one looks in a mirror so situated that it reflects the passing landscape, which, however, must not be visible except in the mirror, one has the illusion of moving in the opposite to the real direction of motion, owing to the reversal of the image in the glass. In both these cases an immediate bodily sensation is induced by a more or less unconscious inference through visual sensations.—*American Analyst.*

Oil Rockets.

An improved method of distributing oil on the waters consists of a rocket to which is attached a cylinder filled with oil. It is said that the rocket can be fired with accuracy from the ship, and that, when it explodes, the oil is scattered just where it is wanted. Several interesting experiments have recently been made between Bremen and New York. In one the rocket was fired to a distance of 1,500 feet and less distances. By the explosion of five rockets at a distance of from 1,200 to 1,500 feet from the ship, a space of 1,500 to 2,000 square feet of water was covered with oil, and the waves were at once smoothed. The rocket was fired 900 feet against a gale. The importance of the invention to deep-water sailors consists in the certainty of explosion of the rocket at a sufficient distance to leave the vessel in calm water during a gale. The invention is said to have been purchased by the North German Lloyd.

Electrical Street Cars.

The Fourth Avenue street car company, of New York, is about to commence running its cars by means of electrical storage batteries carried under the car seats. The company appointed experts to make calculations as to the ratio of cost, gain, and loss in the three methods of propelling street cars. The following are the results:

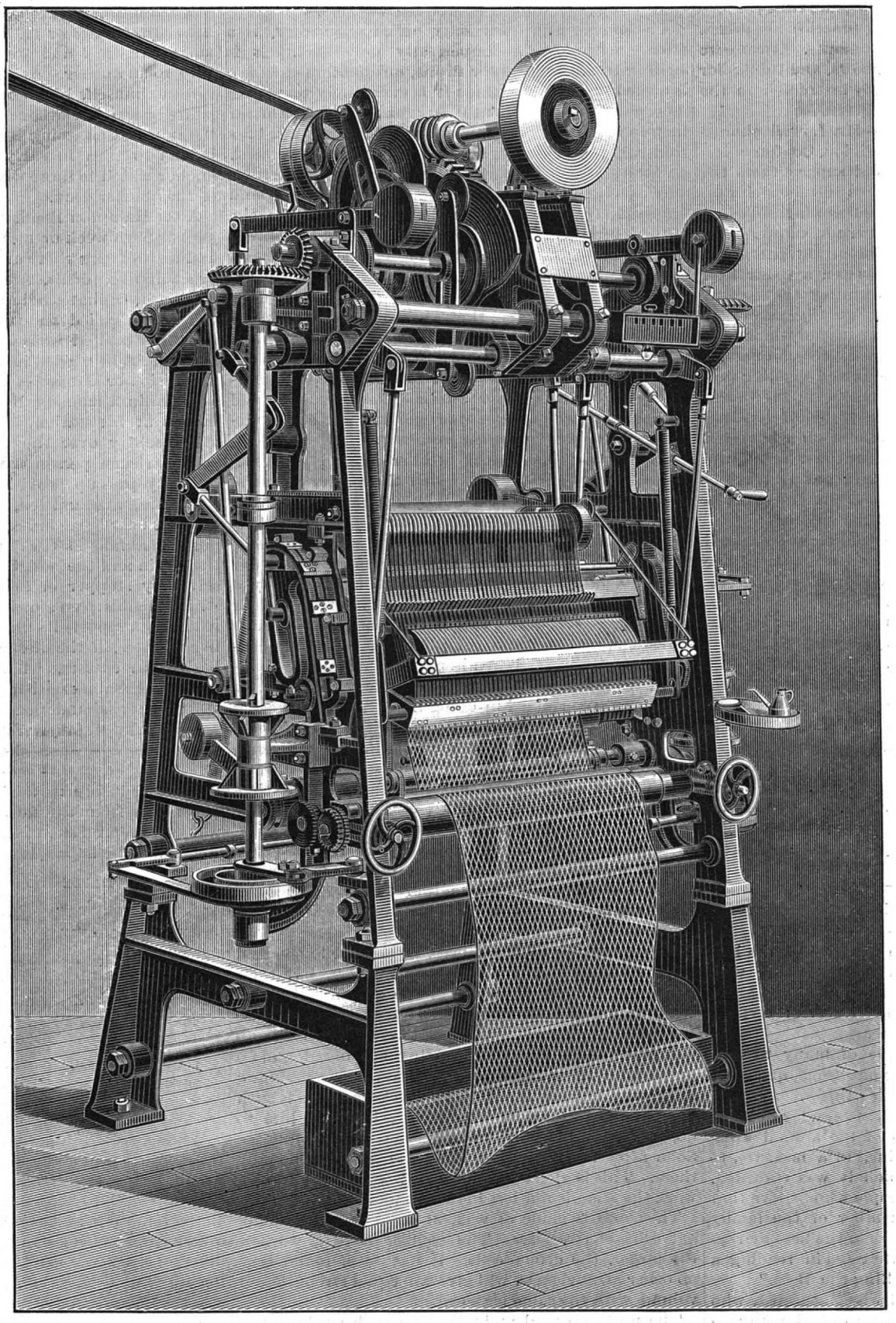
	Electric.	Horse.	Cable.
Cost of cars	1	0·54	0·81
Motive power	1	1·45	1·06
Construction of roadway	1	0·53	2·09
Depreciation and repairs	1	1·47	2·04
Operating expenses (including wages)	1	3·38	1·71
Totals	5	7·37	7·74
Average	1	1·47	1·55

THE MANUFACTURE OF FISHING NETS.

The two extremes of the manufacture of fishing nets are represented, on the one hand, by the net of primitive peoples, composed of branches of very leafy trees connected by vines, and, on the other, by nets made mechanically.

Up to the present, the machine-made net, however, has not replaced the hand-made one. This latter manufacture is justified by the fact that it occupies the wives and children of sailors, affords them very useful though not very remunerative work, and gives a product which, up to the present, has not been equaled by mechanical manufacture.

Nevertheless, the ever increasing requirements of maritime fishery made it necessary to find a mechanical device that should produce a net exactly identical with that made by hand, and that should direct the meshes in a like manner—conditions indispensable for obtaining great strength and preventing the net from getting out of shape.



IMPROVED MACHINE FOR MAKING FISHING NETS.

This problem, which has been worked upon for over twenty years, and has given material for a certain number of patents that introduced further and further improvements, seems to be finally solved in the frame represented in the accompanying engraving, which is reproduced from a photograph of a model which was operated at the Havre maritime exhibition in 1887.

The Galland and Chaunier frame has the general appearance of the large lace frames, and borrows from the latter its main parts (carriages and comb bars), thus permitting of the setting up of machines for manufacturing nets of very great widths (say of from 500 to 600 meshes), and which have relatively simple motions, and act with great precision. The nets manufactured with this new machine are exactly like those made by hand. All the textiles used in the industries can be worked on it, and meshes of variable sizes can be made, either in a single piece, the entire width of the machine, or in several widths provided with natural selvages. According to the material employed, the frame is capable of producing eight or twelve rows of knots per minute, and it takes but one workman to run it.

The machine consists essentially of the following parts: 1. Of a roller placed at the upper part, and upon which is wound the warp twine. 2. Of a bar provided with small steel tubes, and moving under the roller. 3. Of a bar carrying a series of parallel needles. And 4. Of a bar carrying a series of pieces in the form of a bent finger, moving between the tube and needle bars, and carrying also another bar provided with teeth like those of a saw.

These four bars carry as many tubes, needles, fingers, and teeth as there are warp strings on the roller, and all these pieces are equally spaced upon the bars that carry them. This spacing can be regulated at will, and permits of forming meshes varying from 8 to 50 mm. from knot to knot.

The operation of the parts is as follows: The twine from the roller falls in parallel rows, and is passed respectively into each of the tubes of the tube bar, then runs between the fingers and to the left of that which it is to surround, passes between the needles, and the various lengths join at the last knot made. The tube bar performs its evolution, and in this motion each tube passes first to the right of the finger facing it, then descends, surrounds the needle placed opposite, and returns to its first position by passing to the left of the finger that it has surrounded. The lengths of twine, guided by the tubes, have then formed triangular loops between the fingers and the needles, leaving a single length to the right and two lengths to the left. In measure as this maneuver takes place the roller descends so as to pay out the twine necessary for the formation of the loops. These formed, a series of shuttles, exactly like those of lace frames, and carrying the woof, are set in motion and traverse the loops. At this moment the toothed bar takes the second length which is to the left of the finger and carries it to the right, and the shuttles return and pass into this loop, and again take their first position. The woof has then passed all around the third length of the movable twine.

The finger bar then descends, and, reversing itself, leaves its loops upon the needles and returns to its first position. At the same time the roller has risen again so as to take up the twine that it had paid out for the formation of the loops, and, at the moment that the fingers free the latter, it gives the twine quite a strong tension, so as to tighten the knots on the needles. The needles move back and free the knots, and the rubber-covered rollers between which the twine runs, on revolving a certain amount, cause the line of knots to descend.

The production of a frame like the one just described varies with the width of the net and the nature of the twine used. For a width corresponding to 500 meshes and a mean velocity of ten rows per minute, the theoretical production of ten hours' work would be 3,000,000 meshes. Estimating the time lost in renewing the shuttles, etc., as one-third, a production of 2,000,000 meshes per day may be counted upon.—*La Nature.*

REPRODUCTION OF ARTICULATE SPEECH AND OTHER SOUNDS.

(*Continued from first page.*)

cording surface, and perfect accuracy in the same, or centering for the cylinder, is rendered unnecessary. To the diaphragm cell is attached a flexible tube, furnished at its free end with a mouthpiece, into which the words to be recorded are spoken.

The record cylinder consists of paper wound in a peculiar way, to cause it to maintain its cylindrical form, the outer surface of the paper being coated with a specially prepared wax. Below the cylinder is arranged a pan for receiving the fine shreds of wax cut by the stylus from the cylinder in the operation of recording the message. The groove constituting the record is microscopic in size, it being only three thousandths of an inch wide and about two thousandths deep. One hundred and sixty grooves to the inch are cut on the cylinder. The saddle which holds the diaphragm cell is formed of two parts hinged together to facilitate its removal from the support.

Fig. 3.—LONGITUDINAL SECTION OF RECORD CYLINDER.

After the complete record has been made, the cylinder is either removed and placed in another machine, or it is allowed to remain, and the recording diaphragm is replaced by the small reproducing diaphragm shown in Fig. 5. This diaphragm is connected by a thread with a small rounded finger pivoted in the end of the arm which supports the diaphragm, and adapted to engage the groove and indentations made by the stylus of the recording diaphragm.

To the reproducing diaphragm cell is attached a flexible tube, which is branched and provided at its extremities with ear pieces similar to those of a stethoscope. The ear pieces are placed in the ears, as shown in Fig. 1. The rotation of the cylinder containing a message causes vibrations to be set up in the reproducing diaphragm which are similar in character to those of the recording diaphragm which produced the impressions upon the cylinder.

The machine is driven by connection with any power having a fairly uniform speed. In the engravings the machine is represented as being driven by a small electric motor.

The paper cylinders are very light, perfectly portable, and may be transmitted by mail with the same facility as an ordinary letter. The cylinder will fit any graphophone without any adjustment of the instrument.

The graphophone has been in practical use for some time past, carrying on correspondence between New York and Washington, and in receiving dictations in every-day matters of business, the dictations being written out on a type writer by a copyist who listens to the graphophone.

By means of the starting and stopping key, which throws the driving wheel in and out of gear with the recording cylinder, the message can be reproduced sentence by sentence, and reproduction stopped between any two words, or in the middle of a word if desired. This enables the copyist to take from the graphophone as many words as can be retained in mind, and the machine waits while they are being printed on the type writer or written out, as the case may be. Should it be desired to repeat the message, a simple motion of the hand, occupying only a second or two, places the reproducer on any part of the record, and the latter can be repeated a thousand times if desired.

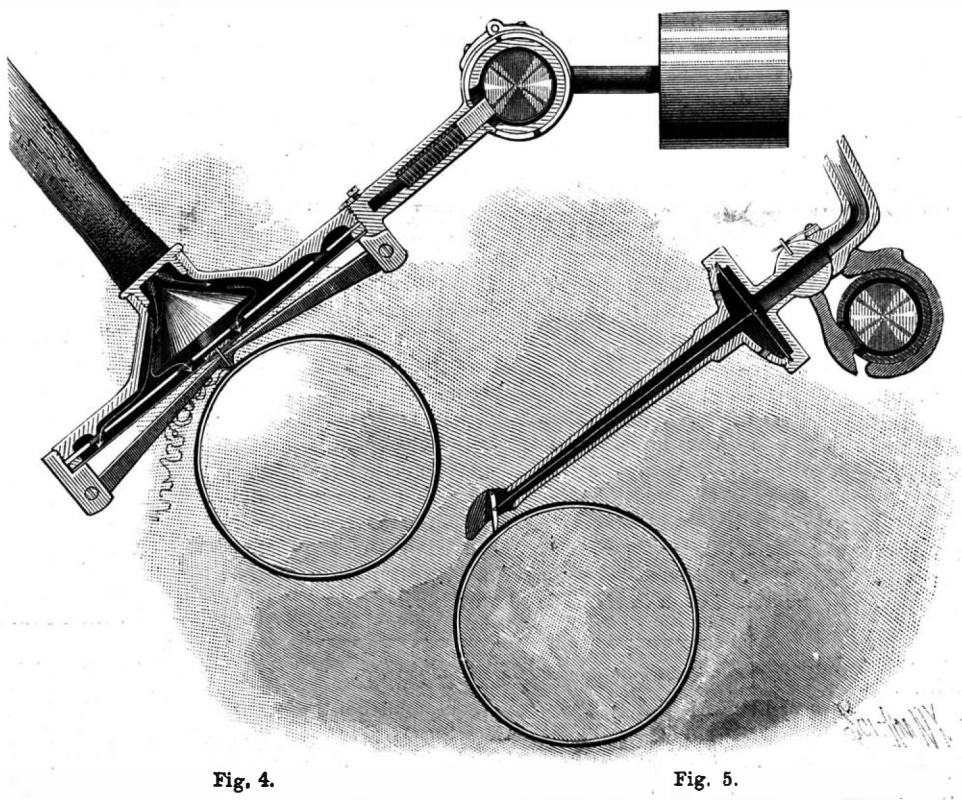


Fig. 4. SECTION OF RECORDING DIAPHRAGM.

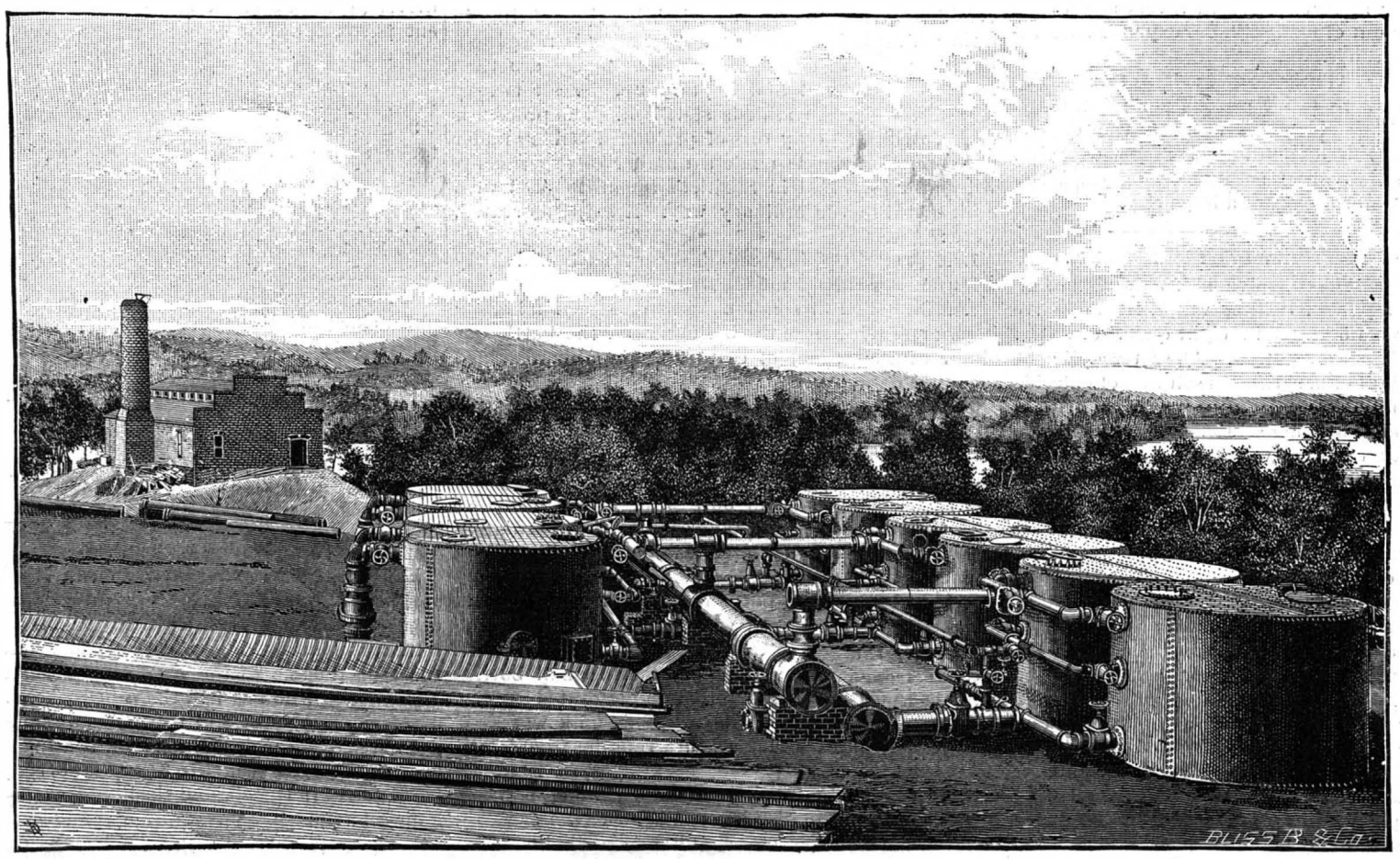
Fig. 5. SECTION OF REPRODUCING DIAPHRAGM.

The graphophones in general use are provided with treadle motors, which, acting through a very sensitive regulator or governor, gives to the record cylinder a perfectly uniform motion of rotation, and as all machines are regulated to run at exactly the same speed, a record made on one machine can be reproduced correctly on any other.

THE NATIONAL SYSTEM OF PURIFYING WATER BY FILTRATION, PRECIPITATION, AND AERATION.

A new system for the filtration and aeration of water for the supply of cities and towns, and whereby also water may be readily and thoroughly purified for manufacturing purposes, at a comparatively small cost, is being introduced by the National Water Purifying Company, of No. 145 Broadway, New York City. The accompanying illustration represents the plant furnished by the company for purifying the water supply of the city of Chattanooga, Tenn., the system having also been adopted for public purposes at Champaign, Ill., Lawrence, Kan., Winnipeg, Man., Kokomo, Ind., Exeter, N. H., and Hackensack and Hoboken, N. J., and by numerous manufactories in all sections.

The water enters the filter at the top, under pressure, and passes down through a bed of fine sharp sea sand, or coke and sand mixed, to the outlet valves at the bottom, which are so arranged as to prevent the escape of any of the filtering material. A precipitating device, which can be opened or closed at will, is arranged in the water space above the filtering material, and near the inlet pipe, to furnish a certain amount of alum or other chemical to the inflowing water, where such addition is needed for the precipitation of sewage, vegetable stain, etc., this precipitate being deposited with the impurities at the top of the filter bed, and thrown out when the filter is washed. To cleanse the filter, a washing pipe, with lateral branches, having perforations on their upper surface, is arranged from ten to twelve inches below the top of the filtering material, and, the inlet pipe having been closed, and a waste pipe near the top at the opposite side opened, a reverse current is sent through the top surface of the filter bed. As it is well known that most of the impurities taken from water by a filter are deposited at or near the top of the filter bed, it is found that, in general practice, five minutes' time will be sufficient, with a strong reverse current, to wash out the impurities that would be taken from the water in five hours, when the water being filtered is quite bad, while it will not be necessary to wash the filter but once a day, unless the water is very muddy and impure. Besides this layer of washing pipes near the top of the filter bed, a similar layer of pipes is arranged in connection with the outlet valves at the bottom, whereby, when it may be deemed necessary, or once in every twenty-four hours, a reverse current may be sent through the bed from the bottom, after first washing the top of the bed, as before, to break up the



FILTER PLANT OF NATIONAL WATER PURIFYING COMPANY AT CHATTANOOGA, TENN.

passages made by the water in previous filtering. The ability to clean the filter so quickly does away with the necessity, in most cases, of using alum or other chemicals to produce sparkling water, and great economy is effected in the water used for cleansing the filter bed, by thus washing the top part only in ordinary service, there being no loss of head or pressure, or of the filtering material.

We append a report on the National filter plant at Chattanooga, Tenn., which forms the subject of our illustration:

To W. S. KUHN, General Manager, American Water Works and Guarantee Co., Pittsburg, Pa.

DEAR SIR: Having made a thorough test of the National filter plant, I find as follows:

That it will readily purify three million gallons per day. In fact, the ten No. 17 filters gave four million gallons in twenty-four hours, of Tennessee River water, removing all suspended matter and impurities, and rendering the water clear and bright. In washing the filters they are arranged to wash two at once, doing away with the necessity of operating one set of valves. Each battery of two filters takes but twenty-four minutes in cleaning, or two hours to thoroughly wash the entire plant of ten filters, using a four inch pipe in washing, under 45 lb. pressure, thus making the plant very economical in time and water in cleansing. There is a bed five feet deep of Long Island sand in each filter. This sand is entirely without crevices, and can be thoroughly cleansed by a reversed current. In washing the filters, the top of the bed, say six to twelve inches, is washed first, as most of the impurities taken from the water in twenty-four hours are lodged on the surface of the sand bed. Four minutes' flow of water will answer for the surface washing; then a reverse current is sent through the bottom of the bed, which breaks it up and throws out all of the finer particles in the lower part of the sand bed. No labor is required in the process of washing, the pressure of the water alone accomplishing, by the reverse current, a thorough cleansing of the sand bed in the filters, the only labor necessary being to open and close the valves in the pipes once each day, which requires no skill.

The citizens of Chattanooga are to be congratulated on the result produced by our National filter plant; and in future they will have as handsome and pure a water supply as New York City, which is conceded to be the best in the world for domestic and manufacturing purposes. And this fact of the purity of our city water supply should lead to an increased interest in our city and a rapid growth in population.

Respectfully submitted,

NISBET WINGFIELD,
Supt. City Water Co.

Chattanooga, Tenn., June 25, 1888.

The aeration of the water is accomplished by means of an air compressor, whereby air is forced into the water under a high pressure. The process is simple and inexpensive, and the amount of air forced into the water can be regulated as desired, according to the requirements in each case. This system can be applied to open filter beds, as well as to the closed top pressure filters shown in the illustration, and with a great saving in labor, as the pressure of water in washing the filter beds is far more effective in a very short time than a great amount of manual labor expended according to the old methods.

These filters are regularly made in sizes of a capacity ranging from 5 gallons to 250 gallons per minute, the company furnishing the plant to meet the desired maximum supply, and guaranteeing its capacity, whether for an individual manufacturing establishment or for the water supply of a large city.

Seasonable Hints for Comfort and Health.

A Good Disinfectant.—Dissolve half a drachm of nitrate of lead in a pint of boiling water, then dissolve two drachms of common salt in eight quarts of water. Pour the two mixtures together. After the sediment has settled, the liquid is a saturated solution of chloride of lead. A cloth dipped in it and hung up in a room will purify a fetid atmosphere. It may also be used to pour down a sink, drain, or water closet. This is very cheap, as a pound of nitrate of lead will make several barrelfuls of the disinfectant.

Damp Cellars.—If a cellar has a damp smell and cannot be thoroughly ventilated, a few trays of charcoal set around on the floor, shelves, and ledges will make the air pure and sweet. If a large basketful of charcoal be placed in a damp cellar where milk is kept, there will be no danger of its becoming tainted.

The following, it is said, is an admirable cure for damp cellar walls: Boil 2 ounces of grease with 2 quarts of tar for nearly twenty minutes in an iron vessel, having pounded glass 1 pound, and slaked lime 2 pounds, well dried in an iron pot and sifted through a flour sieve. Add some of the lime to the tar and glass to form a thin paste, only sufficient to cover a square foot at a time about an eighth of an inch thick.

Keeping Butter.—A simple mode of keeping butter in warm weather is to invert a large crock of earthenware, or a flower pot, if need be (varying with the size of the vessel containing the butter), over the dish or firkin in which the butter is held. The porousness of the earthenware will keep the butter cool, and all the more so if the pot be wrapped in a wet cloth, with a little water in the dish with the butter. Not the porosity of the earthenware, but the rapid absorption of heat by external evaporation, causes the butter to become hard.

To Expel Mosquitoes.—Take of gum camphor a piece about one-third the size of a hen's egg, and evaporate it by placing it in a tin vessel, and holding it over a lamp, taking care that it does not ignite. The smoke will soon fill the room and expel the mosquitoes, and, even though the windows should be left open all night, they will not enter the room as long as the odor remains.

How to Cool a Cellar.—A great mistake, says *Medical Classics*, is sometimes made in ventilating cellars and milk houses. The object of ventilation is to keep the cellars cool and dry, but this object often fails of being accomplished by a common mistake, and instead the cellar is made both warm and damp. A cool place should never be ventilated, unless the air admitted is cooler than the air within, or is at least as cool as that, or a very little warmer. The warmer the air, the more moisture it holds in suspension. Necessarily, the cooler the air, the more this moisture is condensed and precipitated. When a cool cellar is aired on a warm day, the entering air being in motion appears cool, but as it fills the cellar, the cooler air with which it becomes mixed chills it, the moisture is condensed, and dew is deposited on the cold walls, and may often be seen running down them in streams. Then the cellar is damp and soon becomes mouldy. To avoid this, the windows should only be opened at night, and late—the last thing before retiring. There is no need to fear that the night air is unhealthful; it is as pure as the air of midday, and is really drier. The cool air enters the apartment during the night and circulates through it. The windows should be closed before sunrise in the morning, and kept closed and shaded through the day. If the air of the cellar is damp, it may be thoroughly dried by placing in it a peck of fresh lime in an open box. A peck of lime will absorb about seven pounds, or more than three quarts, of water, and in this way a cellar or milk room may soon be dried, even in the hottest weather.

Sterilized Milk as a Food.

In the April number of our esteemed contemporary the *Dietetic Gazette* is an article by Dr. A. Caille upon the mode of preparing sterilized milk for the use of infants. The fact that milk just as it comes from the breast of woman or the udder of the cow is aseptic makes it *a priori* reasonable to believe that aseptic milk is the most natural and healthful form to use. The readiness with which milk becomes impregnated with germs and undergoes fermentation is well known. To rid it entirely of these germs, Dr. Soxhlet, of Munich, has devised a sterilizing apparatus which is easily used, comparatively inexpensive, and has been, we are told, extensively introduced into households at Munich. This apparatus consists essentially of a number of small (five ounce) glass bottles, with rubber and glass stoppers combined. There is a tray for holding these, fitting in a tin pot for boiling the milk. The milk is raised to a boiling point in the small bottles. These are then hermetically closed and kept at 212° F. for twenty minutes, when the milk is sterilized. The process is really, therefore, only one of prolonged boiling under pressure. Dr. Caille made a number of experiments with milk sterilized in Soxhlet's apparatus and with milk boiled in the ordinary way. Results, as stated, were:

1. Milk sterilized in Soxhlet's apparatus, boiled thirty minutes, remained good eighteen days.

2. Milk boiled in small bottles for fifteen minutes; before removing from the boiling water the bottle was closed with a pledget of cotton. This milk remained good five days.

3. Milk boiled in small bottles for fifteen minutes; then taken from the water, and each bottle closed with a tight, non-perforated rubber stopper. This milk remained good five days.

4. Milk boiled in small bottles for fifteen minutes; then taken from the water and each bottle immediately closed with a good quality cork stopper. This milk remained good five days.

5. Milk boiled in a pot, and put into small bottles after cooling, and closed with a cork stopper. Sour after four days.

6. Milk boiled in a pot, and put into small bottles after cooling, and closed with non-perforated rubber stopper. Sour after four days. [This milk was kept in a spare room with temperature ranging from 50° to 70° F.]

7. Milk boiled in a pot in the usual manner, and left standing in an open dish in a room with a temperature of 75° F.: (*a*) ordinary store milk had a distinct sour taste and smell after *eight hours;* (*b*) good "bottle milk" "turned" after fifteen hours.

8. Milk boiled in a pot in the usual manner and placed in the ice box in an open dish: (*a*) ordinary store milk "turned" after eighteen hours; (*b*) good bottle milk "turned" after twenty-six hours.

Dr. Caille further concludes that:

The boiling of milk for twenty to thirty minutes under slight pressure, in small bottles hermetically closed, is all that is necessary to practically carry out the principle involved in sterilization; *i. e.*, to destroy the germs of fermentation.

The essential materials are small bottles with Soxhlet's stoppers and a tray.

Milk boiled in small bottles for twenty minutes and immediately closed by rubber, cork, or cotton stoppers will keep sweet, if put on ice, for several days.

The boiling of milk in the ordinary way is faulty. All milk for infants' and children's use should be boiled in small bottles in a water bath for twenty minutes, when it will keep much longer than if boiled in the ordinary way and the usual length of time.

The transportation of milk should take place in refrigerator cars during the summer months. This should be secured by legal enactment.

The indications for the use of sterilized milk are believed to be the following:

1. Sterilized milk should be administered to all children deprived of the breast.

2. It may be given to children suffering from diarrhœa or convalescent from cholera infantum, when milk boiled in the ordinary way is not tolerated.

3. A supply of sterilized milk is of the utmost importance for children while traveling.

The fact that sterilized milk is sure not to ferment for a considerable period of time must recommend it strongly. On the other hand, it is believed by some that boiled milk has lost some of its more delicate properties as a food; and as between fresh milk and sterilized milk, we think that no one will hesitate to prefer the former.—*Medical Record.*

American Wares in Austria.

Mr. Charles Jonas, United States Consul at Prague, reports as follows to the State Department:

This consulate frequently receives inquiries from American commercial and trading firms as well as manufacturers touching exports to and imports from the United States, and concerning articles of American origin which could possibly find a market in this country.

Different articles sold in this market under an American label, and believed by the purchasers to be of genuine American origin, are really nothing but cheap German and British imitations. It may safely be said that numerous articles of our American hardware, mechanics' tools, farming implements, and family utensils would find a market in this country if they could be introduced and brought to the notice of the public. Of such articles, after diligent inquiry on the demands and possibilities of the local market, I would particularly name the following:

1. Improved shoemakers' tools, new patterns of tailors' shears and flatirons, latest style of fluters and plaiters.

2. Iron block planes, adjustable block planes with steel cutters, adjustable plumb and levels, sliding bevels, patent and reversible countersinks, steel screwdrivers, geared breast drills, braces, wrenches of different patterns, screw augers and steel auger bits, boring machines, bung borers, patent miter boxes, bolt cutters, lever chucks, hack saws, rip and cross-cut saws, improved sawing machines.

3. Shingling hatchets and claw hatchets, pick mattocks and grub hoes, grindstone fixtures and well wheels, hay and grain forks, manure forks, improved hay knives, cheap lawn mowers.

4. Lock hinge step ladders, wringers of new patterns, door knobs, especially the ornamental patterns, wardrobe and clothes line hooks and pulleys, brackets, flush and surface chest handles and drop handles, drawer pulls, side pulleys and screw pulleys, self-acting shade rollers, twine boxes, paper boxes.

5. Meat choppers, sausage stuffers, ice cream freezers, lemon squeezers, flour and meal sifters, and other articles for family use.

6. Reclining and rolling chairs, barber chairs, folding chairs, light American buggies and cutters, belt lacing, and, finally, different mechanical toys.

Solid Petroleum.

Experiments are being carried on in Russia with the view of finding a process, at once practicable as well as desirable on the score of economy and cleanliness, of solidifying the petroleum used as fuel. According to the report made to the Russian government by Dr. Kauffmann, who has had the principal charge of these experiments, a successful method of accomplishing the desired result consists simply in heating the oil and afterward adding from 1 to 3 per cent of soap. The latter dissolves in the oil, and the liquid, on cooling, forms a mass having the appearance of cement and the hardness of compact tallow. The product is hard to light, burns slowly and without smoke, but develops much heat, and leaves about 2 per cent of a hard, black residuum.

SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

To all matter must be attributed two essential qualities: first, that in virtue of which it occupies space and which is known as extension, and, second, that which allows only one particle or atom of matter to occupy a given space—the property known as impenetrability. That matter occupies space is appreciated by our senses, and needs no particular proof, but that two portions of matter cannot occupy the same space at

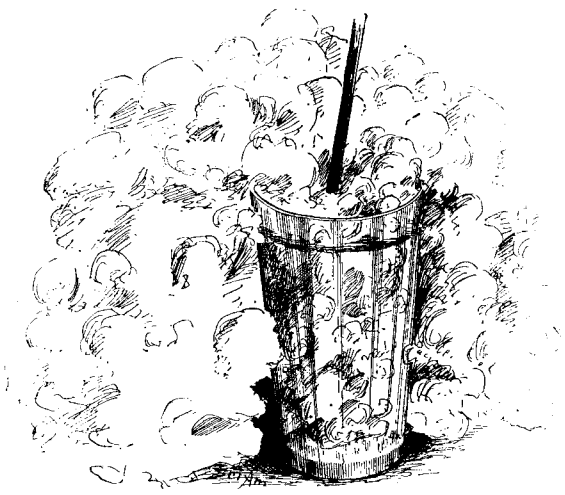


Fig. 1.—A HATFUL OF COTTON IN A TUMBLERFUL OF ALCOHOL.

the same time sometimes seems anomalous, as is shown by some of the following experiments.

Into a tumbler filled with alcohol may be crowded a hatful of loose cotton without causing the alcohol to overflow. The success of the experiment depends upon the slow introduction of the cotton, allowing the alcohol to invest the fibers by capillarity, before they are fairly plunged beneath the surface of the alcohol.

In this experiment the penetration of the alcohol is only apparent; the fibers displace some of the alcohol, but the quantity is so small as not to be observable. If the cotton were compressed to the smallest possible volume, it would be found to occupy but very little space. So small a body would be incapable of raising the level of the alcohol enough to be appreciable by an ordinary observer.

A more puzzling experiment consists in slowly introducing some fine sugar into a tumblerful of warm water. A considerable quantity of sugar may be dissolved in the water without increasing its bulk.

Here the physicist is forced to acknowledge that either the water is penetrated or its atoms are so disposed as to receive the sugar between them, possibly in the same way as a scuttle filled with coal might contain also a bucketful of sand. This latter view is adhered to, and the atom or ultimate particle is held to be impenetrable.

In the case of the mixture of water and alcohol, or water and sulphuric acid, a curious phenomenon is presented. Take alcohol and water, for example. Two equal volumes of alcohol and water, when mixed, occupy less space than when separate. If the sum of the volumes of the two separate liquids is 100, the volume

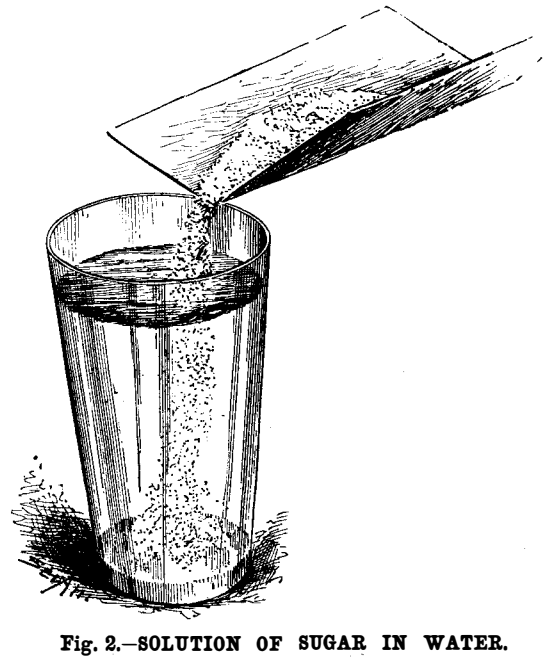


Fig. 2.—SOLUTION OF SUGAR IN WATER.

of the mixture will be only 94. In the case of the mixture of sulphuric acid and water, the difference is greater.

An easy way to perform this experiment is to fill a narrow-necked flask up to a line which may conveniently be marked by a rubber band around the neck, then removing one-half of the water, measuring it exactly, and replacing it with a volume of alcohol exactly equal to that of the water removed. It will be found that when the liquids are mixed, the mixture will not fill the flask up to the original mark.

The only reasonable explanation of this phenomenon is that the molecules of the two liquids accommodate themselves to each other in such a manner as to reduce the pores, and thus diminish the volume of the mixture.

COHESION.

A pretty illustration of cohesion—the force which holds the molecules of matter together—is shown in Fig. 5. In the bottom of a suitable vessel is placed a few drops of olive oil, and into the vessel is carefully

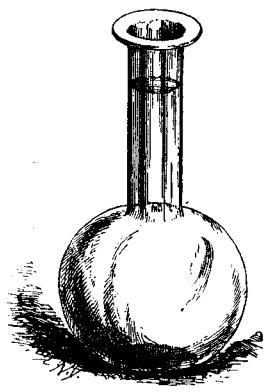


Fig. 3.
Representing Volume of Unmixed Alcohol and Water.

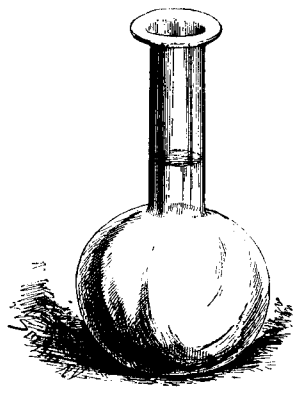


Fig. 4.
Reduction of Volume of Alcohol and Water Mixture.

poured a mixture of alcohol and water having the same specific gravity as the oil. The oil will be detached from the bottom of the vessel, and will in consequence of the cohesion of its particles assume a spherical form. Another method of performing this experiment is to introduce the oil into the center of the body of dilute alcohol by means of a pipette. By careful manipulation a large globule of oil may be introduced in this way. Cohesion tends to cause liquids to assume a

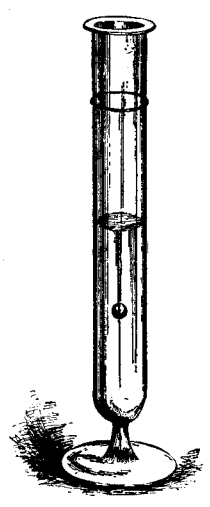


Fig. 5.
Oil Globule Suspended in Equilibrium.

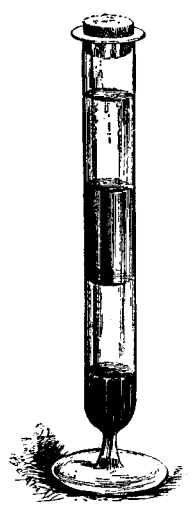


Fig. 6.
Vial of Four Liquids.

spheroidal form, but in the case of liquids in large masses gravity causes them to assume the form of the vessel in which they are contained. The tendency of liquids to assume a spheroidal form is seen in the rain and dew drops, in liquids dropped from bottles, also in liquids thrown in drops on surfaces which they do not moisten. Water spattered upon a surface covered with lycopodium is an example of this.

SPECIFIC GRAVITY.

The difference in the specific gravity of liquids is illustrated in a striking manner by the "vial of four liquids," shown in Fig. 6. A test tube with a foot makes

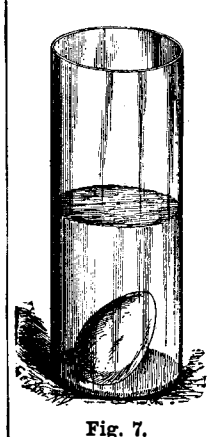


Fig. 7.
Egg in Fresh Water.

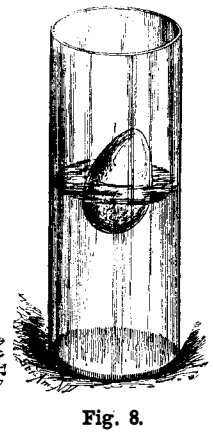


Fig. 8.
Egg Buoyed up by Salt Water.

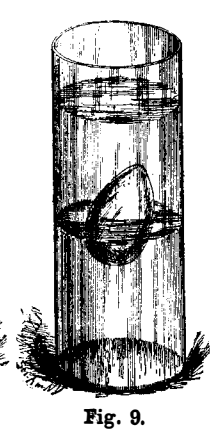


Fig. 9.
Egg in Equilibrium between two Liquids of Different Densities.

a convenient receptacle for the liquids. In the bottom of the tube is placed mercury. The second liquid in order is a saturated solution of carbonate of potash. The third is alcohol, colored with a little aniline red to mark the division of the liquids more clearly. The fourth is kerosene oil. When these liquids are shaken up they mix mechanically, but when the tube is at rest the liquids quickly arrange themselves in their original order.

The egg experiment, shown in Figs. 7, 8, and 9, although without novelty, is interesting on account of its simplicity and effectiveness. Two pint tumblers, or similar vessels, are necessary for this experiment. Half fill one with water and the other with strong brine. Into the water drop an egg. It goes to the bottom (Fig. 7). An egg dropped into the brine floats (Fig. 8) By carefully pouring the brine through a long funnel or through a funnel with an attached tube, which will reach to the bottom of the tumbler containing the pure water, the water and the egg will be lifted and the egg will float in equilibrium at the middle of the tumbler.

The first experiment shows that the egg is a little more dense than pure water, the second that brine is more dense than the egg, and the third that the egg can be supported in equilibrium between two liquids of different densities.

Precautions in Bathing.

The bathing season, though not yet advanced, has already been marked by the levy of that fatal tribute which year by year is exacted of the ignorant and the indiscreet. The recent death by drowning of a young man in the public baths at Poplar suggests one cause of accident which is too apt to be overlooked. The deceased had entered the water soon after partaking of a hearty meal, and the fatal result was attributed to cerebral congestion due to sudden immersion at such a time. What may have been the particular appearances observed after death in this case we have no means of judging, but it may be well to consider shortly some reasons why the practice of bathing soon after meals is justly condemned. Effusion of blood in or upon the brain, when it occurs in such cases as that already referred to, is probably not a primary cause of mischief, but rather a consequence founded on other circulatory and nervous disturbances. It is an evidence of eclampsia, and the physiological basis upon which this is founded consists in that inward diversion of blood toward the alimentary tract which characterizes normal digestion, the other tissues, notably the brain, being at the same time proportionally anæmic, and the action of heart and lungs impeded by a distended stomach. A natural result of cold immersion at this stage is to encourage or induce a tendency to syncope, to concentrate surface blood still more about the central organs, including the heart, which especially, if at all unequal to its duties, labors ineffectually to readjust the blood pressure, and finally succumbs with lungs and venous system engorged by passive congestion. It is as if an enemy occupied the outworks of a fortress left for a time unguarded, and forthwith paralyzed the resistance of the citadel. It is best, therefore, to wait for at least an hour and a half or two hours after a good meal before bathing. Another danger to be avoided is that of cramp. This is particularly apt to occur after severe exercise or long immersion. The effect of cold being to prolong the contraction, while exhaustion lowers both the power and the elastic recoil of muscle, it is evident that we have in a combination of these forces all that is required for the production of this dangerous condition. The obvious warning implied in these remarks requires no further admonition to impress the fact that the bather in cold water must be economical of time and free from any appreciable signs of muscular exhaustion.—*Lancet.*

The British Association Meeting.

The general arrangements for the Bath meeting of the British Association have now been made. The first meeting will be held on Wednesday, September 5, when Sir H. E. Roscoe will resign the chair and Sir F. J. Bramwell, president-elect, will assume the presidency and deliver an address. On Thursday evening, September 6, at 8 P. M., there will be a soiree; on Friday evening, September 7, at 8:30 P. M., a discourse on "The Electrical Transmission of Power," by Professor W. E. Ayrton; on Monday evening, September 10, at 8:30 P. M., a discourse on "The Foundation Stones of the Earth's Crust," by Professor T. G. Bonney; on Tuesday evening, September 11, at 8 P. M., a soiree; on Wednesday evening, September 12, the concluding general meeting will be held at 2:30 P. M. Excursions to places of interest in the neighborhood of Bath will be made on the afternoon of Saturday, September 8, and on Thursday, September 13.

Machinery in Mexico.

Great Britain supplies about 50 per cent of the total imports of machinery at Vera Cruz, and the United States 30 per cent, a large portion of the latter being light machinery, such as sewing machines. Of the metal goods imported, France and Germany furnish each about 30 per cent, while Great Britain only supplies 18 per cent, and the United States 15 per cent. The British Consul at Vera Cruz states that this is due to the efforts of the French and German representatives, and not to the dearness of British goods. A large portion of the American metal goods imported consists of "notions," ingenious trifles which are chiefly machine-made, and therefore cheap.

Miscellaneous Notes.

Admiral Lord Alcester, in a recent speech in London, made some remarks concerning the British ship builders and gun makers which have occasioned much dissatisfaction. He asserted that the British navy was much behind its neighbors in the quality of its cruisers and in the number of its modern guns. He said that two of the latest additions to the French navy (the Tage and the Cecille) were the most dangerous vessels to an enemy's commerce that had ever been launched, and that the French were building three more.

The fitting up of coast defense guns with devices for finding positions is now being agitated in England. The cost is estimated to be about $250 a gun. By means of this invention, an officer located in any prominent position is able by electrical wires to strike a ship which may be invisible from the battery itself, Major Watkin's "position finder" has been adopted by the British government, and he has received an award of $125,000 for the invention, and is also to be paid a royalty of $5,000 a year for the next ten years.

A valued correspondent, who has lately returned from Australia, states that the rich mines recently noticed in the SCIENTIFIC AMERICAN have not proved to be so remunerative as expected. Great difficulty is experienced in separating the gold. It is hard to flux so much silica as the ore contains. The shares in some of the best of these mines have greatly depreciated in value, and many of those who engaged in the mining operations have been disappointed.

A joint resolution has passed the Senate in favor of allowing Mr. Stillson Hutchins to erect, at his own expense, in the city of Washington, a colossal statue of Benjamin Franklin, in white marble, with a pedestal of Massachusetts granite. It is to be placed at the intersection of Pennsylvania Avenue, 10th and D Streets, N. W.

Mr. A. G. Fisher, of New Haven, Conn., proposes to build a cinder path from New York to New Haven, for the benefit of bicycle riders. It is to be 3 feet in width, and laid at the side of the present road; to be built, however, only where the existing roads are not good. The path will be about 70 miles in length, and the average cost of building is estimated at $75 per mile, or a total of $5,250. A little over ten per cent of the amount has already been subscribed. The various bicycle clubs are expected to assist the enterprise.

A great bicycle race recently took place from the Hotel Leland, Chicago, to Pullman, Ill., a distance of about 18 miles. There were 86 entries, and 71 contestants took the start. Arthur Lunsden, who rode a Columbia 51 inch roadster, was the winner in 54 minutes 47 seconds. He is only 19 years of age and comparatively a new rider. 53 men rode to the finish.

Dr. Neudörfer, of Vienna, has found in a substance called "creoline" a valuable antiseptic. It is a sort of tar obtained from bituminous coal by dry distillation. It is closely related to creosote, carbolic acid, resorcine, and hydrochinon. This substance has been found highly advantageous in preventing the spread of erysipelas, the pains of which it also reduces, and it effects an early cure. By its use, the subcutaneous injections of carbolic acid are not required. He has also used creoline for the treatment of ordinary flesh wounds, and for the removal of tumors. A gauze is prepared which is dipped in a solution of creoline. The doctor considers it the most trustworthy, convenient, and harmless, as well as the cheapest of antiseptic preparations.

Coal has been recommended as an earth connection for lightning rods, but Mr. J. E. Smith has ascertained by actual test with galvanometer that much depends upon the kind of coal that is selected. Out of eight or ten pieces of bituminous coal only one was found to be a fair conductor. Anthracite coal proved to be of no value as a conductor; but coke, especially the grayish kind, such as is made in coking ovens, was found to be an excellent conductor. Charcoal, on the whole, was found to be lacking in conductivity, although some specimens proved to be fair conductors.

Machines for registering the amount of cash received are among the new appurtenances of well regulated retail establishments in this city. The operator presses a key, which turns the register, counts and records the amount paid into the money drawer. When the day's work is done, the machine shows the total amount of cash received, and the cash in the drawer should correspond with the figures on the register. It is said to be a very convenient and valuable machine.

A physician thinks that a law should be made to prohibit the use of galvanized iron lemonade squeezers. He says that every time a lemon is squeezed in one of these machines the acid of the lemon, coming in contact with the zinc, dissolves the same and forms a poisonous salt. Zinc is a metal which is easily attacked by the weakest acids, and no article of food or drink should ever be allowed to come in contact with it.

We have seen a specimen of a new campaign torch which promises to become quite popular. It is made from a combined composition of inflammable matter, and when lighted, burns dry; that is to say, it is free from grease, does not run, and gives off no bad odor. It may be stuck on the end of a handle or pole, can be carried in the pocket, and is always ready for use. It yields a large flame. It burns 30 minutes, and three of them (with the stick) form an outfit suitable for any political procession. They are made by J. A. Heckman, of this city.

At the recent commencement of Stevens Institute of Technology, Hoboken, N. J., it was announced by Mr. S. B. Dod, president of the board of trustees, that he had received from President Henry Morton $10,000 as the first installment toward the endowment of the chair of engineering practice recently created, and now occupied by Mr. Coleman Sellers, of Philadelphia. President Morton has been the chief of the establishment ever since its opening, and to the zeal and exalted ability of his management the success of the Institute is eminently due. His personal labors for the advancement of the institution have been most assiduous, while his pecuniary contributions have been numerous and generous. We believe he has endowed several other important chairs, having contributed altogether somewhere about $50,000. No man stands higher in the rank of prominent educationists than Henry Morton. No institution of learning enjoys a better reputation for excellence and thoroughness than Stevens Institute.

An important decision was lately made in the United States Court at Indianapolis, by Judge Gresham, in the case of Charles F. Brush *vs.* John Owens and others. It was claimed by the patentees that the patent covered the use of the electro-magnet, but the judge held the patent to be limited only to solenoids.

Dr. Donald C. Hood has collected many facts relating to the use of salicylic acid for rheumatism. Of 728 patients treated with salicylates, 523 were relieved of their pains within seven days; whereas, of 612 patients treated by other methods, only 140 were relieved within the same time.

The use of saccharine as a substitute for sugar is not considered safe from a medical point of view. Dr. Worms, in a communication to the French Academy of Medicine, states that of several patients who made use of saccharine by his advice, all but one were soon compelled to give it up on account of the occurrence of dyspeptic symptoms, nausea, loss of appetite, etc. It is usually not until after the substance has been taken for from ten to fifteen days that it manifests its evil influence. It then appears to accumulate in the system.

One of the pipes of the Standard Oil Company, that brings oil from the petroleum regions of Pennsylvania to New York, a distance of 400 miles, recently burst in Vernon township, Sussex County, N. J. Before the mischief was discovered the soil in the vicinity of the broken pipe became saturated and poisoned with crude oil, and ruined for the present. A large quantity of oil flowed into the neighboring streams, and the fishes died by thousands. It is said the farmers will bring suits for damages against the Standard Oil Company, for injuries sustained by this oil flood.

Mr. A. W. Van Dorston estimates there are 1,000,000 cars in the United States, the couplers of which must be changed if the standard of the Master Car Builders' Association is generally adopted. He figures the cost at $28.50 a car, which would make the entire expense of the change $28,500,000. Supposing the present couplers—which must be displaced—to have cost $15 per car, or $15,000,000 for the entire equipment, and that the destruction of cars and car trucks, the wrecks from broken links, the loss of pins and links, the death rate from the free slack and going between the cars to place and replace the links, costs annually $17,000,000 more, or $32,000,000 in all, still he thinks the automatic coupler must be regarded as decidedly the cheapest.

The building of the Edison Electric Illuminating Company in Boston, Mass., was lately destroyed by fire, although it was supposed to be fire proof. It was built of brick and iron, but unfortunately, they laid down wooden floors and sheathed the walls and ceilings with varnished wood. When the fire broke out, the wood produced such a tremendous heat as to warp the iron beams and quickly caused the destruction of the building. Every dynamo in the station was destroyed—the engines and boilers, however, were not injured. New dynamos were telegraphed for at once, and on the Monday night succeeding the fire—which took place on Saturday night—the establishment was again in operation, and the Edison lights throughout the city were working as usual. The conflagration was caused by the overheating of one of the equalizers, by having more current pass through it than it was designed to carry. The fire was thus communicated to the adjoining woodwork.

On the Lehigh Valley Railroad, at Glen Onoko, Pa., there is a switch connection consisting of a gas pipe which extends 1,255 feet from the point where it is operated.

In Oakland, Cal., and other places, compressed air is now successfully used for operating switches having an interlocking apparatus. The system is, in fact, very extensively used on several of our principal railways. It takes up less space than mechanical locking machinery, and the labor of working it is very light. The ground connections can be buried out of the way, and can be led out from the tower in any way most convenient.

"Emmensite" is the name of a new explosive discovered by Dr. Stephen M. Emmens, which has lately been tried with much success. The doctor claims that by the use of one of his cartridges and a gun 40 feet long he can throw a projectile to a distance of 27 miles. We should like to see him do it. At a recent trial with a rifle at 100 yards, a ball fired by a cartridge containing 70 grains of powder penetrated three planks of pine wood 1¼ inches thick; while a charge of 15 grains of emmensite drove the bullets through five of these planks. A shell weighing 66½ pounds was thrown by a half ounce of emmensite twice as high into the air as by the same quantity of dynamite or one and one-half ounces of gunpowder. Various other experiments were made, all showing the superior power of the new explosive.

The bill now before the House of Representatives, for the establishment of a Court of Patent Appeals, is very favorably regarded by several of the members of the Supreme Court of the United States, also by the Commissioner of Patents, and others. One object of the new court is to relieve the Supreme Court from much of the labor now involved in the decision of patent cases. The new court is to consist of a chief judge and four associate judges, who are to have a salary of $8,000 each. The court is also to appoint a clerk and marshal, with various deputies; also a reporter, who is to cause the decisions of the court to be printed, at an expense not exceeding $4 per volume. The court is to hold one term annually.

This Court of Patent Appeals is to have appellate jurisdiction from the courts of the United States having original jurisdiction of cases touching patents, copyrights, trade marks and labels; also from the Commissioner of Patents touching the patentability of invention, priority of invention among several claimants for patents upon the same invention, and in all cases of reissue; also in the registration of trade marks and labels, and the rights of conflicting claimants therefor. All such cases formerly appealable to the Supreme Court are to be heard on appeal to the Court of Patent Appeals. All cases touching patents, trade marks, copyrights, or labels now pending before the Supreme Court are to be transferred to the Court of Patent Appeals.

Death by Electricity.

Dr. Richardson writes on this subject in the *Asclepiad* as follows: "In some researches on the application of the electric discharge for the painless extinction of the lives of animals to be used as food, the details of which I recorded in the *Medical Times and Gazette* for the year 1869, this mode of death was anything but certain in its effects. Sheep stricken apparently into instant and irrevocable death by electricity, after a few minutes showed signs of life, and if they had not been dispatched in the ordinary way by the knife would have been restored to consciousness. The same fact has been observed in attempts to kill dogs by the electric shock, and I once published an instance in which a large dog, struck into perfect unconsciousness by the stroke from a powerful battery, was submitted to a surgical operation while lying, to all appearances, dead, and was yet so little affected as to make an easy and sound recovery. It need not be inferred from such facts as these that the electric shock will not kill at one discharge—in most cases it will—but, exceptionally, instead of killing outright it will simply stun, and may induce the semblance of death instead of the real event. It will be only common humanity, therefore, for the authorities of New York, when they begin to give the *coup de grace* by the electric shock, to supplement the process by a *post mortem* examination of the victims, so that the act may not be crowned by burying the victims alive."

THE Springfield, Mass., *Good Housekeeping* offers twenty-five dollars for the best buffalo bug extinguisher, twenty-five dollars for the best bed bug finisher, twenty-five dollars for the best moth eradicator, and twenty-five dollars for the best fly and flea exterminator.

ENGINEERING INVENTIONS.

A steam engine has been patented by Messrs. Johann C. Grabner, of Kupferhammer, and Henry Ruperti, of Brackwede, Prussia, Germany. It is a cylinder and piston motor wherein the distribution of the motor liquid alternately to either side of the piston is effected without the use of valves or slides, by means of specially constructed passages and ports in the cylinders and their pistons.

A mechanical movement has been patented by Mr. Benjamin F. Andrews, of Myers, Mo. It is for converting reciprocating or oscillating motion into rotary motion, and the invention consists in certain novel constructions and combinations of parts, designed to be available for the propelling of vessels or vehicles, for running machines, or to be applied to engines.

A safety guard for car trucks has been patented by Mr. William H. Walker, of Martinez, Ga. Combined with the truck frame is a cross-braced connection carrying shoes at each downwardly bent end, such shoes being supported just above the rail in front of the wheel, and being flanged, so that they would drop on the rail and serve as a brake in case of breakage of a wheel or axle.

A carburetor has been patented by Messrs. Chester S. King and Edward G. Brown, of Smethport, Pa. It is a combined gas engine and carbureting apparatus, the latter operating the engine and supplying carbureted air to be mixed with air to form an explosive mixture for use in the engine, the speed of the engine controlling the speed of the carburetor, the supply of hydrocarbon thereto, and the supply of gas to the engine.

MISCELLANEOUS INVENTIONS.

A coffin has been patented by Messrs. James P. and John S. Mahon, of New York City. This invention provides a sheet metal coffin which can be easily and cheaply manufactured, can be tightly closed, and is designed to possess the qualities of strength and durability with extreme lightness and portability.

A mail pouch has been patented by Mr. George J. Bedford, of Anamosa, Iowa. It is for the transport of registered letters, securities, etc., and is metal lined and arranged for connection with a metallic belt to be placed about the person of the messenger, and provided with any proper form of lock.

A dump car has been patented by Mr. Joseph Odorizzi, of Trinidad, Col. It has a gate or door at one end hinged at its upper edge upon a horizontal axis by means of a shaft journaled in the sides of the car, the invention covering a simple and efficient means for locking and unlocking the door, through which the car is dumped.

A double harness saddle and yoke has been patented by Mr. Louis A. Mancini, of Montclair, N. J. This invention relates to a device in which the harness saddles are connected together and are adjustable upon their connection, being designed to allow for the movements of the horses, and permit them to move freely and prevent friction of the saddle.

A drill has been patented by Mr. John C. Godwin, of Royse City, Texas. It is specially adapted for turning the drill tool for boring artesian wells, and for prospecting purposes, the invention consisting of a disk connected with the drilling tool, and having a backward and forward turning motion imparted by an especial mechanism.

A glove has been patented by Mr. William Vaughan, of Torrington, Devon County, England. This invention relates especially to gloves made of woven material, and consists in strengthening and protecting the tips of the fingers and tongues by rows of stitching, either in straight or curved lines, the chain stitch being preferred.

A stirrup has been patented by Mr. Thomas J. Taylor, of Howell, Tenn. It consists of a curved piece of wood extending from under the foot around the toe and up above the instep, with a bolt or cross bar for connecting it with the supporting strap, the inside of the curved stirrup frame being formed of leather or other flexible material.

A gate has been patented by Mr. John Flinner, of Boling, Kansas. It is of that class which is hinged about a horizontal axis at one end and at its lowest corner, so as to rise vertically about this center, and is connected by rods with levers mounted upon posts upon opposite sides of the gate, whereby the gate may be operated from passing vehicles without the necessity of alighting therefrom.

A wall paper exhibitor has been patented by Mr. M. Otto Smith, of Creighton, Mo. It is adapted for arrangement with shelving having a projecting cornice at the top, and designed to hold the paper so that it may be unwound from sample rolls, to exhibit it as it will appear on the walls, while it may be readily rewound, and allow free access to the goods on the shelves.

An improvement designed to simplify the construction of plumes, tassels, etc., forms the subject of a patent issued to Mr. Ralph W. E. Aldrich, of Northampton, Mass. The plume is made of Cotswold hide, tanned with the hair on, and bleached or dyed as desired, to be attached in any approved manner to an ornament, instead of the usual fringe of silk, cotton, etc.

A lamp burner has been patented by Mr. Arthur Cautius, of Berlin, Germany. The wick tube consists of two concentric tubes with a space between them for the wick, the inner tube being shorter and the outer one longer and provided with a flange covering the top of the wick, the burning portion of which will be on the inside instead of the top, between the flange and the top of the inner tube.

A vegetable slicer has been patented by Mr. Vincent Bissig, of Greenville, N. J. It is of that kind used for cutting potatoes and similar edibles in a continuous or spiral manner, in which the vegetable is held by one hand and is speared by an entering screw having a knife attached at its outer end, which is rotated to slice the vegetable, the screw keeping up the feed.

A cock for fire extinguishers has been patented by Mr. Charles C. Connell, of Haydenville, Mass. It is of the kind adapted to be opened by the action of heat to permit the escape of a liquid held under pressure, the valve having on its outer end a lever engaging a recess formed in a thin plate of metal that heats at a low temperature, the plate being held in its position by an easily melting solder.

A fluid drawing and measuring device has been patented by Mr. John A. Kendall, of Maysville, Mo. It consists of a measuring cylinder adapted to be placed in the bottom of the tank or vessel, through the sides of which pass connecting pipes connected on the outside with a four-way cock, there being a piston held to slide in the inner cylinder, with other novel features, for automatically measuring coal oil, etc.

Business and Personal.

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NEW BOOKS AND PUBLICATIONS.

A SYSTEM OF EASY LETTERING. J. Howard Cromwell, Ph.B. E. & F. N. Spon. New York, 1888. Pp. 26. Price fifty cents.

This little work gives twenty-six different forms of alphabets, all constructed on the same general system. The space to be lettered is to be divided into parallelograms or squares, as the case may be, and within these as a guide the different letters are drawn and inked. The guide squares, which have been made in pencil, are then erased, leaving the final letters. On so simple a basis as this quite a variety of effects are produced in flat and block letters.

THE COURSE INDICATOR LIGHTS. By C. A. Lidstone. Calcutta, 1885. Pp. 4. With colored diagrams.

A simple system of indicating the course of vessels at night, by supplementing the present sailing lights with four additional ones, is here described. The system is a good one and has much to recommend it. It introduces, naturally, some elements of confusion to an ignorant sailing master, but leaves untouched the present system, if he chooses not to notice the extra lamps. It is clear that some advanced system is needed to prevent collisions at sea, and this certainly seems well adapted for that end.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 26, 1888,

AND EACH BEARING THAT DATE.

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

Air brake, E. Andrews 385,224
Air brake, H. S. Park 385,198
Anchors, machine for making building, J. Russell 385,140
Animal releasing device, J. D. & C. A. Sullivan 385,077
Animal trap, J. T. Belden 385,086
Axle box lids, die for making car, G. W. Morris 385,194
Axle lubricator, car, J. J. Stever 385,213
Bag. See Traveling bag.
Bags and satchels, fastening for hand, G. Crouch. 385,243
Baling press, Meyer & Sutphen 384,993
Baling press, W. F. & G. W. Shafer 385,207
Barrels, apparatus for pitching, L. & O. Haggenmiller 385,178
Baton or club, policeman's, E. D. Bean 385,293
Batteries, electrolyte for galvanic, B. J. Wheelock 385,028
Battery. See Electric battery. Galvanic battery. Secondary battery.
Battery zinc, J. Doyle 385,254
Bed or bed bottom, spring, F. M. Jeffery 385,118
Bedstead fastener, P. Forg 385,260
Bell, call, J. P. Connell 385,166
Bell ringing mechanism, J. Z. White 385,029
Bicycle pedal, W. E. Smith 385,074
Blind, inside, H. A. Benedict 384,954
Boiler. See Steam boiler.
Boiler, F. W. Dean 385,102
Bolt heading machine, E. N. Whitaker 385,080
Boot or shoe G. Valiant 385,218
Boot treeing machine, G. W. Copeland 385,298
Bottle closure, W. Rodiger 385,011
Box. See Journal box. Photographic developing box. Toy money box.
Box lid, W. D. Harrison 385,305
Bracelet chain, G. A. Lenau 385,313
Brake. See Air brake. Car brake.
Brick and tile machines, lubricating die for, R. Niedergesaess 385,317
Brick kiln, G. W. Sharer 385,209
Bridles, check piece for, O. Botsford 385,090
Broom head, W. W. Thompson 385,217
Buckle, back band, R. T. Semmes 385,206
Buckle, safety, J. G. Kitchell 384,984
Buckle, trace, B. C. Smith 385,146
Bustle, V. H. Buschmann 385,296
Buttonhole flies, mechanism for stamping and cutting out, Valiant & Dancel 385,219
Cable grip, F. H. Morse 385,195
Calendar, J. Cussons 385,245
Can. See Oil can.
Can opener and sheet metal cutter, E. Hawes 384,973
Cane, machine for cutting sugar, L. Bon 385,234
Car brake, A. Reese 385,007
Car coupling, W. M. Cutter 385,101
Car coupling, R. H. Dowling 385,301
Car coupling, E. L. Keeler 385,185
Car coupling, Lorraine & Aubin (r) 10,941
Car coupling, H. S. McKague 385,129
Car coupling, F. W. Parsons 385,000
Car coupling, H. S. Sanders 385,204
Car coupling, Ward & Fallgatter 385,027
Car door, grain, A. B. Taylor 385,021
Car, railway, C. W. Littlefield 384,987
Car spring, railway, B. J. La Mothe 385,061
Car step, F. A. Stanwood 385,017
Cars, metallic platform for railway, J. T. Goodfellow 385,177
Carburetor, King & Brown 385,121
Carpenter's framing gauge, L. P. Pickering 385,321
Carpenter's gauge, A. Laporte 385,124
Carriage wheel fender, G. C. W. Magruder 384,989
Carrier. See Cash and package carrier. Cash carrier. Hay carrier.
Carving machine, S. F. Moore 384,995
Case. See Piano case.
Cash and package carrier, W. T. Geltz 385,110
Cash carrier, N. Newman 385,196
Cash indicator, register, and recorder, C. B. Hopkins 385,265
Cash register and indicator, Patterson & Davis 385,199
Casks or barrels, agitator for, G. M. Thompson 385,151
Caster for stoves, etc., A. H. Conn 385,240
Cellars waterproof, rendering, F. J. De Borger 385,103
Cigar cutter, Young & Shertzer 385,221
Clapper or rattler device, O. Pagan 385,002
Clasp, J. Merriam 385,192
Cleaner. See Drain cleaner. Grain cleaner.
Clip. See Stocking suspender clip.
Clock dial, A. Bannatyne 385,160
Closet. See Water closet.
Cloth cutting machine, G. J. W. Galster 385,050
Clutch, J. Bruyiere 385,093
Clutch, E. B. Lake 385,123
Coats, making, W. Cohen 385,096
Cock, gauge, Hodges & Davie 385,052
Compass, electric alarm, H. A. Chase 385,043
Compass, mariner's recording, H. A. Chase 385,042
Cotton press, L. Miller 385,193
Coupling. See Car coupling. Friction coupling. Pipe coupling.
Checkrein attachment for harness, H. J. Wing 385,082
Checkrein hook, J. H. Hill 385,115
Cuff holder, E. L. Clancy 385,239
Cultivator shovel, D. Leigh 385,275
Cuspidor, Annen & Fox 385,159
Cutter. See Cigar cutter. Rod cutter.

Cutter head. G. S. Shimer 385,325
Dental hammer and plugger, electro-magnetic, P. Helmer (r) 10,940
Dental plate, J. F. Sargent 385,142
Desk and organ, combined, O. E. & G. C. Wick 385,081
Desk, school, E. Murray 385,316
Dibble, T Seller 385,324
Digger. See Potato digger.
Dividers, spring, J. F. Guthrie, Jr 384,971
Door mat, A. M. Cooley 385,044
Dough cutting machine, A. Day 384,964
Drain cleaner, convertible, E. J. Robinson 385,283
Drier. See Salt drier.
Drier, G. W. Sharer 385,208
Drill, J. C. Godwin 385,111
Drilling, feeding device for, Lodge & Dreses 385,063
Drilling rig, G. Corbett 385,241
Drilling tool, A. Benzie 385,088
Drum, friction, H. J. McKeown 385,191
Dust collector, J. S. Ash 385,037
Dust collector, C. M. Hardenbergh 385,263
Duster, feather, G. M. Richmond 385,070
Eaves trough hanger, H. T. & H. O. Lawrence 384,985
Educational apparatus, J. Dushane 385,046
Electric battery, E. M. Hewitt 385,308
Electric cut-out, C. G. Perkins 385,067
Electric light system, B. E. Sunny 385,020
Electric machinery, dynamo, A. Reckenzaun 385,068
Electric switch, P. J. Tracy 385,023
Electrical connector, Stitzel & Weinedel 385,215
Electrical distribution, system of, T. A. Edison 385,173
Electrical purposes, switch for, W. A. Carey 385,041
Electricity and purifying water, generating, J. E. Siebel 385,145
Engine. See Rotary cylinder engine. Steam engine.
Envelope tablet, H. Phillips 385,320
Evaporator, N. B. Rice 385,202
Fabric. See Roofing fabric.
Farm gate, P. Dyer 385,302
Faucet, E. P. J. Freeman 385,108
Fence machine, C. F. Gillet 385,304
Fences, lightning escape for wire, A. Cockrell 385,095
Filling, lining, and covering material, H. W. Johns 385,120
Filter, F. K. Way 385,333
Finger ring, W. P. Sinnock 385,073
Firearm, magazine, J. M. & M. S. Browning 385,238
Fire cracker cannon, J. J. Loud 385,127
Fire cracker holder, A. Willis 385,032
Flask. See Moulder's snap flask.
Flour mill, J. J. Faulkner 385,175
Flushing tank, automatic, H. L. Howe 384,978
Fodder binder, W. Leupold 385,126
Food for cattle, horses, and swine, composition, W. Wernich 385,220
Forceps, etc., clamping device for, F. A. Stohlmann 385,076
Fork. See Hay or straw grappling fork.
Foundations, frost protector for, H. H. Morgan 385,278
Frame. See Quilting frame.
Friction coupling, O. Kromer 385,122
Furnace. See Ore smelting furnace.
Furnaces, apparatus for charging billets, bars, etc., into, F. H. Daniels ..... 385,248 to 385,250
Furnaces, apparatus for charging billets or bars into heating, F. H. Daniels 385,251
Furnaces, device for mixing air and gas for, H. Schlimme 385,072
Gauge. See Carpenter's gauge. Carpenter's framing gauge.
Galvanic battery, Brown & Clark 384,958
Galvanic battery, E. E. Starr 385,147
Game, G. P. Lathrop 385,190
Garment supporter, F. E. Bright 385,237
Garment, ventilated, E. S. Helwitz 385,306
Gas fixtures, cock for, J. Prentice 385,134
Gas pressure regulator and cut-off, G. S. Faulkner 384,967
Gate. See Farm gate.
Gimp machine, G. Faustmann 385,048
Glove, W. Vaughan 385,154
Glove fastener, W. D. Thompson 385,331
Governor, J. W. Thompson 385,152
Grain binder, Kennedy & Anderson 385,059
Grain cleaner, J. S. Ash 385,036
Grain meter, G. H. Kamman 384,983
Grinding mill, M. J. Althouse 385,025
Grooving apparatus for cardboard, leather, and like material, T. Remus 385,201
Hammer for blacksmiths, spring, Stewart & Wiswall 385,018
Hand press, domestic, J. W. Condon *et al* 385,165
Hanger. See Eaves trough hanger.
Harness, trace lock for, L. Anderson 385,233
Harrow, J. W. Dobyns 384,966
Harvester, G. Esterly 385,047
Harvester, corn, G. B. & J. T. Snow 385,286
Harvester, grain binding, A. O. Slentz 385,285
Harvesters, cutting apparatus for, Blair & Bush 385,164
Hat and coat rack, folding, G. D. Tolman 385,153
Hat, ventilated, M. Postlethwaite 385,282
Hats, sweat band for, T. W. Bracher 385,092
Hay cap, J. Brady 384,957
Hay carrier, G. H. Fowler 384,968
Hay loader, W. S. Nichols 385,281
Hay or straw grappling fork, E. V. R. Gardner 384,970
Hay rake and ricker, combined, R. O. Davis 385,252
Hay sling, A. & C. A. Church 384,960
Heater. See Water heater.
Heel burnisher, C. J. Addy 385,291
Hinge, J. Wien 385,156
Hinge for traveling bags, etc., C. Reinisch 385,133
Hinge for trunks, bags, etc., stay, W. Durand 385,255
Hinge, lock, T. S. Beebe 385,162
Hinge, spring, H. P. Kochsmeier 385,312
Holder. See Cuff holder. Fire cracker holder. Lamp holder. Music holder. Rein holder.
Hook. See Checkrein hook. Snap hook.
Horse detacher, G. T. Parker 385,132
House interiors, finishing of, W. J. Boda 385,238
Ice or refrigerating machine, F. W. Wolf 385,157
Identifying device, E. R. Fitch 385,106
Indicator. See Cash indicator. Station indicator.
Iron, manufacturing oxide of, A. C. Bradley 385,235
Joint. See Rail joint.
Journal bearing, anti-friction, J. W. Hyatt, 385,266, 385,267
Journal box, W. B. Turner 385,288
Kiln. See Brick kiln. Malt kiln.
Knitting machine, D. C. Bellis 385,163
Knitting machines, reversing mechanism for, H. C. Rightmire 385,322
Lamp holder, incandescent, W. A. Carey 385,039
Lantern supporter, C. Smith 385,015
Life buoy, reel, A. Rust 385,323
Lock. See Permutation lock.
Loom let-off mechanism, J. Morton 385,279
Lubricator. See Axle lubricator.
Lubricator, W. A. Carey 385,040
Malt kiln, G. Reininghaus 385,137
Marine signal, W. G. Spiegel 385,016
Mat. See Door mat.
Measuring device, automatic water, W. Lammers 385,274
Measuring tank for oil, Lindsay & Ross 384,986
Measuring vessel, W. Evans, Jr 385,303
Mechanical movement, B. F. Andrews 385,084
Meter. See Grain meter.
Milk preserving machine, G. Roth 385,013
Mill. See Flour mill. Grinding mill.
Mould, J. Hemphill 384,976
Moulder's snap flask, E. Riley 385,203
Mop wringer, J. A. Crandall 385,170
Motor. See Wave power motor.
Mower, lawn, E. E. Johnson 385,272
Mug, Z. T. Hall 385,179
Multiple switch boards, test system for, C. E. Scribner 385,205
Music holder, E. W. Robinson 385,010
Nail plate feeder, J. C. Gould 385,112
Nut machine, F. Lackner 385,187, 385,188
Nut machine, A. Marland 385,128
Oil cakes, moulding press for, O. P. Bushnell 385,094
Oil can, E. G. Cushman 385,244
Oil can, Straffin & Robertson 385,328
Ore smelting furnace, C. W. Barry 385,229
Oyster spat, obtaining, O. B. Beach 385,161
Package for butter or similar material, S. Smyth 385,075
Paddlewheels, feathering, D. J. Blasier 385,232
Pail, dinner, F. G. O. Ehle 385,257
Papers, etc., return packet for the transmission of, W. B. Nolley 385,197
Pasting apparatus, Lorenz & Honiss 385,064
Permutation lock, J. C. Barr 385,228
Photographic developing box, portable, T. W. Harvey 385,264
Photographic sheet, I. Cohn 385,297
Piano case, A. F. Delano 385,172
Pill or lozenge machine, G. A. Smith 385,326
Pinchers, W. E. White 385,030
Pipe coupling, Stewart & Stone 385,148
Pipe coupling, J. Story 385,287
Pipe coupling, automatic, J. F. McElroy 384,991
Pipe covering, H. W. Johns 385,119
Plane, J. A. Bissegger 385,231
Planing maching, wood, J. Ross 385,284
Plant support, potted, F. S. Fahnestock 385,174
Plow, Ball & Bender 384,952
Plow, Thompson & Secrist 385,216
Plow, adjustable double, A. A. Billingslea 385,294
Plow, garden, W. H. Heard 385,051
Plumber's traps, device for making, A. Boll 384,956
Polishing apparatus for wood, etc., T. Davids 385,171
Portfolio, G. Auth 385,085
Potato digger, C. Roberts 385,071
Potato sorter or grader, H. D. Herrington 385,114
Press. See Baling press. Cotton press. Hand press.
Printer's standing galley, W. Severin 385,144
Printing, M. D. Wilkins 385,081
Printing envelopes, blank attachment for tympan sheets for, G. F. Kimball 385,060
Printing machine, C. B. Cottrell 385,099
Printing machines, inking apparatus for, C. B. Cottrell 385,098
Printing machines, sheet delivery apparatus for, C. B. Cottrell 385,100
Propulsion, marine, W. M. Jackson ..... 385,182 to 385,184
Pump, J. North 385,319
Pump attachment, T. Diffley 385,004
Pumping apparatus, electrical, F. J. Sprague 385,211
Punch, paper, J. C. Jensen 385,056
Quilting frame, C. A. Vestal 385,078
Rack. See Hat and coat rack.
Rail joint, G. N. Hodgdon 385,116
Railway cables, driving drum for, F. A. J. Beigel 385,230
Railway, electric, G. H. Condict 385,097
Railway, electric, R. M. Hunter ..... 385,053 to 385,055, 385,180
Railway, electro-motive, G. T. Woods 385,034
Railway frog, G. W. Parsons 385,066
Railway signal, electric, S. C. C. Currie 384,962
Railway spike, J. S. Fox 385,107
Railway switch, L. Blackstone 384,955
Railway switch, S. B. Sabens 385,141
Railway track and joint, B. S. Doran 385,253
Railways, cable gripping apparatus for street, J. H. Dale 385,246
Rake. See Hay rake.
Refrigerator, A. I. Dexter 384,965
Refrigerator, C. A. Bluhm 385,089
Register. See Cash register.
Regulator. See Gas pressure regulator. Tooth regulator.
Rein holder, F. W. C. Macdonald 384,988
Revolvers, extracting mechanism for, D. H. Rice. 385,009
Rheostat, J. W. Packard 385,001
Ring. See Finger ring.
Rivet burr remover, E. H. Perkins 385,133
Rod cutter, H. V. Robinson 385,139
Rolling articles of metal, die for, D. E. Kempster. 385,186
Roof, R. J. Claflin 384,961
Roofing fabric, A. Jones 385,057
Rotary cylinder engine, J. S. Barden 385,226
Rolls, apparatus for removing and setting, W. R. Jones 385,058
Rubber fountains, etc., stopper for, A. C. Eggers. 385,256
Rule, level, and plumb, combined, C. Adkins 384,951
Salt drier, C. T. Bartlett 384,953
Salve, J. R. Smith 385,210
Saw, A. Weymar 385,079
Saw, circular, D. N. Hurd 384,979
Saw guide, adjustable, D. J. Murray 385,131
Saw jointer and gauge, combined, W. S. Ralya 385,006
Saw sharpening machine, R. M. Pine 385,004
Saw swage and sharpener, W. H. Williams 385,290
Scale, weighing and price, J. E. Pitrat 385,005
Scales, weight recorder for weighing, J. A. Jamieson 385,310
Scraper, J. C. Pequinot 385,003
Scraper, track, H. H. Littell 385,062
Scutching or fiber cleaning machines, feeding apparatus for, A. H. Death 385,300
Seal for checks, safety, A. M. Woodhull 385,158
Seat. See Velocipede seat.
Secondary battery, A. Reckenzaun 385,200
Sewing machine for connecting soles and uppers, P. A. & J. Coupal 385,299
Shafts and ordnance, manufacture of, J. H. Flagler 385,049
Shaping machine, Davison & Buckley 384,963
Shell, M. Von Forster 385,332
Shoe tongue fastening, C. F. Crowell 385,045
Sickle grinder, Gamble & Rutt 385,176
Signal. See Marine signal. Railway signal.
Signal compensator, J. J. Turner 385,025
Signaling apparatus, semaphore, A. Barnes 385,227
Sleigh runner, E. K. Van Gorden 385,289
Snap hook, H. McPherson 384,992
Soap and glycerine, making resin, Domeier & Hagemann 385,105
Sofa and surgical table, combined, Judy & Forbes 385,311
Soil pipe ventilator, Hadfield & McConnell 385,262
Spectacles or eyeglasses, frame for, F. A. Henninger 385,307
Spring. See Car spring. Vehicle spring.
Sprinkling lawns, device for, E. J. H. Richardson. 385,069
Stairway, T. Rogers 385,012
Stalls, mat for horse, L. S. Stowe 385,149
Station indicator, B. W. Lyon 385,314
Steam boiler, P. Hanrez 384,972
Steam engine, Grabner & Ruperti 385,113
Steam trap and boiler feeder, W. Simpkin 385,014
Steering apparatus for vessels, B. A. Fiske 385,259
Stirrup, T. J. Taylor 385,150
Stocking suspender clip, F. E. Taylor 385,330
Stockings, manufacturing, Morley & Greenwood 385,315
Stove, cook, C. Rathbone 385,135
Stove, gas, W. Moore 385,277
Stovepipe thimble, A. Staub 385,212
Stove polish, C. Zimmerling 385,335
Strainer, A. Boss 385,235
Strainer, drink, C. B. Hopkins 384,977
Strainer, milk, A. Bowdish 385,091
Straw stacker, M. Heinecke 384,974
Supporter. See Garment supporter. Lantern supporter.
Switch. See Electric switch. Railway switch.
Tag, T. J. Yund 385,083
Tank. See Flushing tank. Measuring tank.
Tanning process, W. Zahn 385,222
Teaching of notation and numeration, apparatus to facilitate the, W. E. Carr 384,959
Telegraph relay, Stitzel & Weinedel 385,214
Tile and roofing plate, illuminating, J. Jacobs 385,270
Tile, drain, H. H. Baltzley 385,292
Tile, illuminating, J. Jacobs 385,268, 385,269
Tile, side wall, etc., illuminating, J. Jacobs 385,271
Time ball, C. Muller 384,996
Tobacco, apparatus for treating leaf, G. W. Brooks 385,088
Tooth regulator, W. S. How 385,117
Toy money box, C. A. Bailey 385,225
Trap. See Animal trap. Steam trap.
Traveling bag, A. C. Frankel 384,969
Truck, M. Huntley 385,181
Truck, car, L. K. Jewett 384,981, 384,982
Trucks, safety guard for car, W. H. Walker 385,155
Trunk, W. J. Large 385,189
Trunk lift and strap fastening, combined, G. Crouch 385,242
Tube and making the same, Garver & Straight 385,109
Tube welding apparatus, J. Hemphill 384,975
Type writing machine, F. A. Remley 385,008
Valve, balanced governor, P. S. Kingsland 385,273
Vehicle dash screen, J. H. Murphy 384,997
Vehicle, jump seat, C. H. Stratton 385,329
Vehicle, self-propelling, C. Benz 385,057
Vehicle, spring, T. L. Sturtevant 385,019
Vehicle spring, P. H. Whiting 385,334
Vehicles, spring seat for, L. Warren 385,033
Velocipede, J. E. Evans 385,258
Velocipede, M. H. Marlin 384,990
Velocipede, T. Redman 385,136
Velocipede seat, T. B. Jeffery 384,980
Ventilator. See Soil pipe ventilator.
Vulcanizing apparatus and other purposes, automatic regulator for, O. B. Brann 385,236
Water closet, W. S. Cooper 385,167, 385,168
Water closet structure, W. S. Cooper 385,169
Water closet system, H. S. Miller 385,130
Water heater, G. W. Lewton 385,276
Water, means for utilizing the current force of running, C. M. Garrison 385,261
Water wheel governor, J. Morton 385,280
Wave power motor, F. Starkenberg 385,327
Weather strip, T. K. Milroy 385,065
Weighing and registering apparatus, automatic grain, L. C. Tryon 385,024
Welding, apparatus for electric, E. Thomson 385,022
Well drilling machine, J. F. Moore 384,994
Wheel. See Paddlewheel.
Winding roll for winding paper and other fabrics, J. Waldron 385,026
Windmills, pump rod for, D. B. Nettz 384,998
Wire annealing apparatus, F. H. Daniels 385,247
Wire bending and forming machine, S. T. Newman 384,999
Wire bending implement, D. W. Norris 385,318
Wire netting, B. Scarles 385,143
Woodworking and planing machine, E. H. Lee 385,125
Wringer. See Mop wringer.
Zinc, amalgamating, E. M. Hewett 385,309

DESIGNS.

Badge, E. A. Crawford 18,407
Burial casket, L. Stein 18,413
Carpet sweeper casing, W. J. Drew 18,408
Educational model, U. G. Houston 18,409
Envelopes, back of, J. Stern 18,414
Game tablets, ornamentation of, J. W. Spalding, 18,411, 18,412
Pen and pencil case, T. Richards 18,410
Quilting, C. T. Wagner 18,415, 18,416

TRADE MARKS.

Beer, Cramer & Kersten 15,634
Beer, J. Schlitz Brewing Company 15,646
Clother pins, Tobyhanna and Lehigh Lumber Company 15,648
Coal and coke, Jumbo Coal and Coke Co 15,641
Cocoa, soluble, Bensdorp & Co 15,629
Extracts, perfumes, oils, and soaps, Bloomingdale & Levy ..... 15,631 to 15,633
Eye water, E. Billsland 15,630
Glucose, grape sugar, and corn sirup, American Glucose Company 15,627
Lard, Rohe & Brother 15,645
Medicated food for animals, F. E. Sanborn 15,639
Medicinal preparation for uterine diseases, Dios Chemical Company 15,638
Medicine, tonic, J. M. Alloways 15,626
Medicine, tonic, H. Ballantine 15,628
Metal articles for decoration and for toilet and table use, Miller & Berry 15,642
Paper in sheets and pads, blotting, H. S. Crocker & Co 15,636
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