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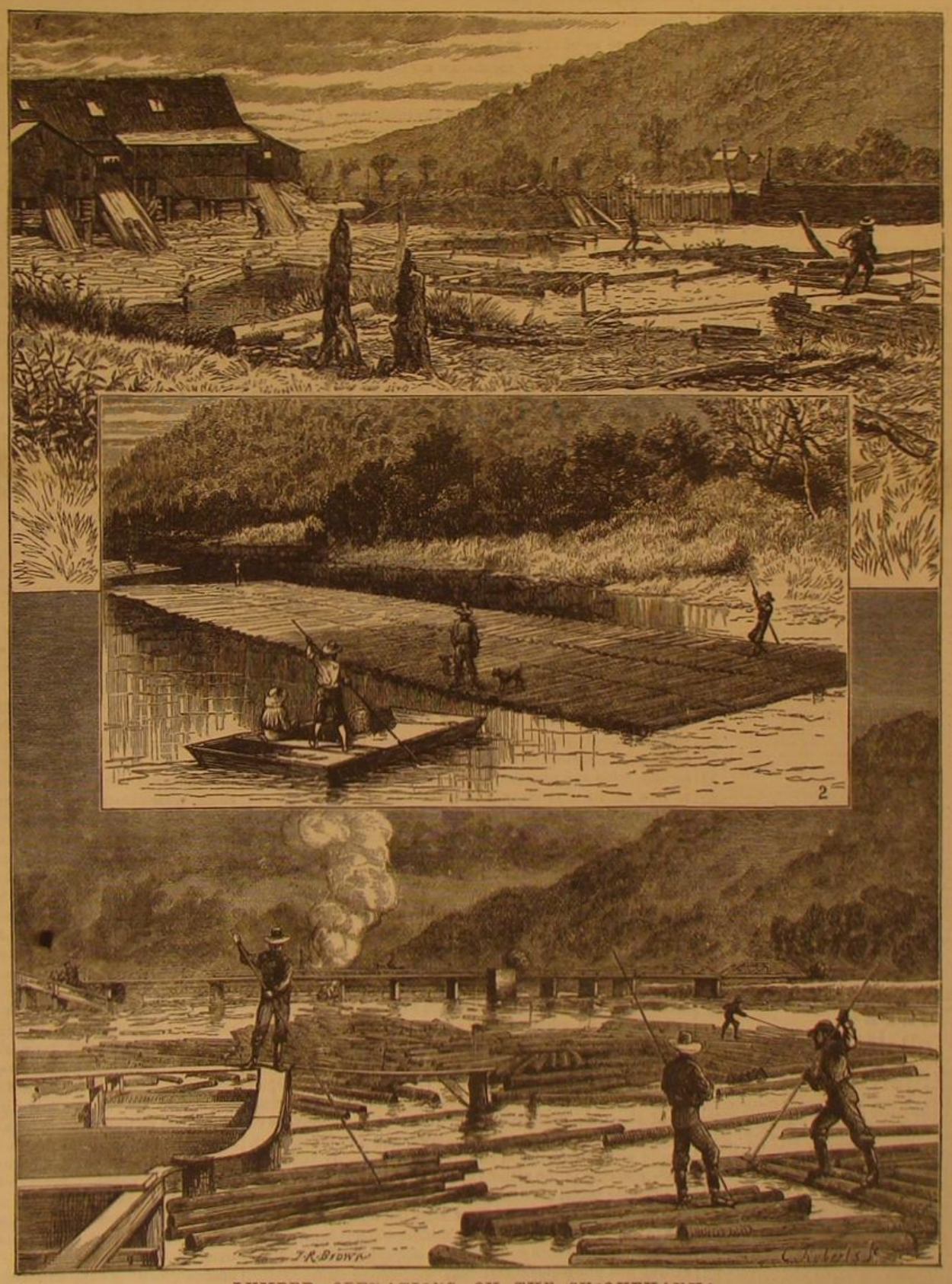
THE LUMBER TRADE IN PENNSYLVANIA.

The timber or lumber trade of Pennsylvania is exceedingly extensive, and is increasing in such proportion that it is reckoned—at the present rate of cutting—that most of the white pine of the State will be exhausted in four or five years. This will give some idea of the enormous demand for lumber, particularly the white pine and the hemlock logs. The central depôt of the trade in Pennsylvania is Williamsport, a handsome city on the Susquehanna. The timber is cut in the autumn and winter from the huge forests on the slopes bordering the river for two to three hundred miles above Williamsport. The logs are slid down into the stream, and then, being formed into mighty rafts, are floated down to the city by the spring freshets At Williamsport they are caught by a boom, which will hold 300,000,000 feet of wood at one time. The voyage sometimes occupies several days, and is somewhat hazardous, as the rafts are frequently wrecked—a fact rendered manifestly evident to the visitor by the number of stranded logs left lying along the river shore when the floods subside.

Arrived at Williamsport, the timber is stored in immense ponds until required for the sawmill, or until, once more formed into rafts, they are floated down the river to the millsmany miles below the town. These sawmills form one of the chief features of Williamsport, where they number about thirty, and with an annual capacity for turning out 225,000,000 feet of lumber. The machinery in these mills is most ingenious, and quickly converts the huge trunks into logs, cutting them into lengths for building or other purposes. The enormous piles of lumber awaiting a market seem almost incredible to the European visitors, says the London *Graphic*, who are accustomed to look upon timber as a somewhat expensive commodity.



LUMBER OPERATIONS ON THE SUSQUEHANNA.

In the upper part of our engraving is shown the great dam at Williamsport above mentioned. In the middle is seen a raft of logs floating down stream and below is one of the lumber ponds, where the logs are stored till required for use or for other markets.

Williamsport is situate on the west branch of the Susquehanna, and is a thriving city, rapidly growing in population and manufactures. Its prosperity is mainly due to the lumber trade, for which the river and the West Branch canal, which flows through the city, afford great facilities. It is surrounded, as our illustrations show, by lofty, well wooded hills, the scenery of which is of the greatest beauty. Of the extent of the trade which is its chief support, much has been written; but its rapid development is still going on, the timber sawn in this country in 1870 being nearly three times as much as that in 1860. The demand is on the increase, and there seems to be no possible check except the disforesting of the land adjacent to the lumber markets: an event which has long threatened us, and against which we have often warned our readers. When this comes to pass, prices of lumber will rise, and perhaps demand will fall off; and the planting of timber trees, now and for some years to come, is the obvious and only remedy for such a disaster. We have no doubt that steps will be taken to avert this threatened damage; but the necessity cannot be too frequently brought before public attention. It is not the present that has to be provided for; it is the future, and the destroying ax may proceed, in the next few years, to work greater havoc than ever in our forests.

The Mystic Pump.

The above name has been given to the novel steam pumping engine which we illustrated on page 371 current volume, and which either operates through the condensation of steam as a pump, or, by a simple modification, may be changed into a condensing steam engine. We learn that its manufacture will be at once begun by Messrs. Rumsey & Co., of Seneca Falls, N. Y., under the superintendence of the inventor, Mr. E. G. Shortt. The promptitude with which this recent invention is thus to be brought into practical use shows commendable enterprise on the part of the above firm, while the fact of their undertaking the work is excellent proof of the worth of the machine itself.

Bleaching Cotton.

Some of our readers may find it a great convenience to be able to bleach a few hanks or short pattern warps, in order to get samples round quickly; therefore, we give the following safe method:

Boil well your twist, having first put in the water 2 ozs. of soda ash to the gallon of water; wash off in cold water. Mix 1 lb. of fresh chloride of lime in 2 pints of water, crushing all the lumps, and then add 43 pints more water. After allowing time for the lime to settle, pour off the clear chloride liquor, and immerse the yarn for about seven hours, in a cool place. Care must be taken to keep the chloride solution and the yarn from contact with iron. Wring out and wash in cold water, and do not allow the yarn to remain in the air very long. Then immerse in a well mixed solution composed of 26 drachms of double oil of vitriol to 45 pints of water. Allow the yarn to remain in this acid solution ten hours, then wring out and wash off in cold water. In order to thoroughly remove the acid, work it well through a good white soap bath, and to this add a little marine blue to give the yarn any desired tint. Finally wash through warm water to clear away the soap. These proportions will do the least possible injury to the strength of the yarn. The solutions may be used stronger if it is desired to shorten the length of time of the processes. If soft mule yarn has to be bleached the solution may be used about one third weaker; but if doubled yarn, the strength of the solutions must be increased, according to the perfection required in bleaching.—*Textile Manufacturer*

Bleaching Wool.

MM. Daudier and Son thus describe a new process for bleaching wool. It consists in plunging the wool or vegetable matters into a concentrated bath of chloride of calcium, and submitting them to prolonged boiling; to the bath may be added some hydrochloric acid, or compounds of that acid with metallic bases, such as aluminum, iron, zinc, copper, or tin, which will then act energetically on vegetable matters, while it will produce no alteration on wool.

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VOLUME XXXV., No. 26. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, FOR THE WEEKS ENDING SATURDAYS DECEMBER 23 AND 30, 1876.

THE END OF THE YEAR.

The present issue is the fifty-second and last number of the SCIENTIFIC AMERICAN for 1876.

Saturday is our usual dating day; and as there happen to be 53 Saturdays this year, we adjust them to the 52 weeks, by giving the double date of Saturday, December 23, and Saturday, December 30, to our present number, which finishes the year. *No paper will therefore be issued next week.*

Our next number, the first of the new year, will bear date Saturday, January 6, 1877. We hope that subscribers who have not already renewed will be prompt to send forward their subscriptions, and thus prevent loss or break in the continuity of their numbers.

We return our heartfelt thanks to the thousands of friends and patrons who have so generously encouraged our labors during the past. They are scattered far and wide throughout the world; but we hold them in the closest esteem. To one and all, we send the kindliest greetings for the New Year, wishing them the largest measures of prosperity, health, and happiness.

Contents.

(Illustrated articles are marked with an asterisk.)

PUBLISHERS' CARD.

Some twenty thousand of the subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT will find, printed on the wrappers which envelope this week's papers, the information that their subscriptions expire with this number, coupled with a request that the same may be renewed for the coming year. Those desiring the weekly visits of our papers to continue without interruption will therefore serve themselves by remitting as soon as possible. At the same time they will, in so doing, greatly favor the publishers, as the latter are thus enabled to form proper estimates as to the magnitude of the edition which it will be necessary to print at the commencement of the year. The rates of subscription to either journal or to both combined remain as heretofore.

The success of the SCIENTIFIC AMERICAN SUPPLEMENT has proved so genuine, and its circulation risen so greatly beyond our anticipations, that we shall continue its publication and use our best endeavors to increase its value.

Those who have taken the papers through newsdealers are recommended to continue to do so, and those in the habit of procuring their papers weekly from the stands will find them there as of old; and those who neither subscribe for nor buy the SCIENTIFIC AMERICAN nor its SUPPLEMENT may peruse them both on file in any working men's reading room in the country, or in the library of any institution of learning in the world.

A handsome subscription list will be sent as usual on application by those desiring to form clubs.

CITY SUBSCRIBERS.

Persons residing below 50th street, in this city, and in any part of Brooklyn, can receive the SCIENTIFIC AMERICAN or the SCIENTIFIC AMERICAN SUPPLEMENT by carrier or by mail, as they may prefer, by sending their names to the office of publication. Persons residing above 50th street are supplied from this office by mail only. The price of the SCIENTIFIC AMERICAN by mail will be the same as heretofore, $3.20 per annum; or, if delivered flat and unfolded by special carrier, $3.50. The SCIENTIFIC AMERICAN SUPPLEMENT will be delivered by carrier or by mail, as desired. Price $5 a year.

City subscribers ordering both papers will have them served at $7 per annum, payable in advance. Either paper may be had at any of the news stores in this city or Brooklyn, and of periodical dealers throughout the country.

THE ARTIST VS. THE ARTISAN.

An amusing objection was raised the other day by a literary paper, against Dr. Richardson's proposed City of Health The sanitary promise of Hygeia was not questioned, nor the desirability of easier and healthier ways of living; yet the utter failure of every attempt to realize such a scheme was confidently predicted, on the ground that everything about such a residence would be so new and matter of fact, so utilitarian and unartistic, that nobody could be persuaded to live in it. Certainly no one of culture or refinement would be able to endure its brand-new sanitary and labor-saving devices, or the absence of all those time-honored customs and domestic surroundings which make the average old mansion at once so picturesque and so hazardous to health.

No doubt the critic spoke from honest conviction. Much dwelling upon objects and opinions conventionally regarded as artistic has brought him and others like him to a frame of mind in which ugliness, if only ancient enough and sanctified by artistic associations, is positively cherished. Even squalor and wretchedness—in others—if picturesque, is more to be admired than any commonplace trimness, however wholesome. To minds of such artistic sensibility a laborer well fed and comfortably clad has no attractions; the same man picturesquely gaunt and ragged is an object to look upon with rapture, to draw, or to paint. So a cluster of shanties, perched on the rocks of Mackerelville or huddled in one of its muddy hollows, and swarming with ragged and half-famished children and goats, is infinitely more pleasing to the artistic eye than the finest row of garden-fronted model cottages ever occupied by a thrifty and comfortable community of New England operatives. It is one of the traditions of art to admire such things, and in admiring them artists and art critics are simply true to their calling and professional training.

But where there is one who can legitimately look at life from that point of view, there are scores who pretend to do so because they think it essential to high breeding, culture, and all that sort of thing. The artist delights in old things either from their intrinsic beauty or because from their age they have acquired artistic associations; therefore those who ape the artist think they too must declare "the old is better," and deplore the tendency of the age to depart from the ways of the fathers. Who ever saw a sewing machine in a Dutch interior by one of the old masters? or a stationary washtub? or any other of the modern utilitarian devices for the kitchen? How then can such things consist with true artistic feeling? Away with them!

A pretty illustration of this sentimental reaction against modern improvements, and the eagerness with which it is caught up by certain would-be æsthetic people, appears in—and in the circulation of an extract from—one of Clarence Cook's clever papers on furniture in *Scribner's*, just now going the rounds of the newspapers. We would be the last to depreciate the service which Mr. Cook is doing in these papers by directing the attention of furniture makers and buyers to simpler and at the same time more sensible and artistic styles of house furnishing and adornment than formerly prevailed, or to question the sincerity of his affection for the antique. Finding his models of excellence chiefly in old-time works of art, he has naturally come to look upon antiquity as almost in itself a certificate of merit. So when he finds in classic art representations of an abandoned arrangement for hand washing, he straightway falls in love with it and advocates its readoption.

The illustration he gives, from a woodcut by Albert Dürer—a trough attached to the wall and supplied with water from a metallic or earthen globe suspended above by a rod and chain, with an old style roller towel hanging beside it—is certainly ugly enough to delight any artist; but it does not strike us as at all a contrivance calculated to supplant anything now in use except it be the tin wash basin on a stool, still to be seen in some back country kitchens. Mr. Cook thinks such an exposed cistern ever so much more convenient and pretty than the secluded marble basin in common use in our cities: but then Mr. Cook professes "such a dislike, to the whole of what are called in housekeeping 'modern improvements,'" that his preference may be easily accounted for.

"I am well aware," he goes on to say in justification of this fancy, "that there is a sufficient reason for our American wholesale adoption of mechanical contrivances in the miserably inefficient character of our servants. In nine cases out of ten we use gas, furnaces, and plumbing, instead of lamps or candles, open fires, and movable washing apparatus, because it saves immensely in the labor and expense necessary to carry on a household. But now-a-days, when better servants are to be had, and 'service' is getting to be more and more a profession, we may reasonably plead for a more domestic and less hotel and steamboat way of living, knowing that in doing so we are pleading also for healthier ways of living, and not merely for picturesqueness."

True enough: we do need healthier and more domestic ways of living; but it seems to us that we are not so likely to get them by increasing the number of our "domestics," or by a reaction against labor-saving contrivances, as by the increase and perfection of such household conveniences. The increasing intelligence of servants, so far from doing away with the need of mechanical helps, really adds immensely to their practicability and usefulness. As every housekeeper knows, the chief objections to most "modern conveniences" have arisen from the ignorance and stupidity of servants with a genius for converting labor-saving and sanitary inventions into trouble breeders and traps for disease. What seems to be really wanted, therefore, is not fewer improvements, but more and better ones—devices so well contrived that stupid servants cannot easily make them go wrong: or better still, so automatic in their action that the mediation of human intelligence or stupidity, in their sphere of action, is unnecessary.

A trusty servant to call one in the morning, one not likely to forget or mistake the hour, is undoubtedly a great convenience. But after all, the best of servants may oversleep, or in a thousand ways fail to do one's bidding as surely as a clock, which costs less, takes up less room, never intrudes upon one's privacy, and never forgets to perform its allotted task. So in every department of household service, there is much to do which mechanism can do more cheaply and satisfactorily than muscle, and ultimately mechanism will get the work to do. And we have no fear that in course of time the artistic mind will become reconciled to the new order of things. The most venerable of our domestic surroundings was once an innovation, and the most modern of modern improvements will acquire with age the associations which artists delight in. But whether they hold their own or are supplanted by something newer will depend, not on the plaudits or protests of sentimentalists, but on the inventive skill of those who seek for something better.

TRANSFUSION OF BLOOD.

About half a century ago, a great discovery was heralded in medical science, namely, the transfusion of blood from one individual to another, by which process, it was claimed, the sick and weak were at once to be made well and strong, and even old people rejuvenated, by the transfer of youthful blood into their veins and arteries. At that time the medical papers reported the most astounding results and prophecies of still more astounding realizations, which were, however, soon proved futile; and the excitement gradually died away, and before long the whole subject was almost forgotten. But it was too important to be neglected by the medical profession, and it has been revived in Europe, notably in France and England. Recently at a clinic in one of the Manchester (England) hospitals, the attending surgeon came to the bed of a young patient who had lost so much blood by the amputation of a limb that he became moribund, his death being momentarily expected. The surgeon told his class that this was one of the rare cases in which the life of an individual could be saved by transfusion of blood, and at once a noble medical student offered himself for the experiment, and allowed over sixteen ounces of his blood to be transfused into the veins of the dying patient. The result was perfectly satisfactory;

the sufferer revived, in two hours afterwards he recognized people, and he was soon on the way to recovery. This incident, being published in the newspapers, has given occasion to the renewal of the discussion among semi scientific and *quasi* medical editors; and, as in the beginning of this century, when the subject was first agitated, all kinds of absurd ideas are being promulgated, such as that the old can be made young again by the influence of the transfused blood: the weak can be made strong, the sick healthy: and even bad-tempered people can be made lamb-like by transfusion of sheep's blood, and cowards courageous by the infusion of the blood of a dozen or so of game roosters. The conditions in every case are the draining of as much defective blood as is to be replaced by the more perfect material. Of course such ideas are merely idle notions, and in no case can transfusion of blood do any good, except when a temporary relief is needed at a critical moment.

It should be remembered that old blood is always being consumed, and new blood is continually being manufactured in the system, from the chyle into which the food eaten is first transformed. In this strange manufacturing process, the whole digestive apparatus, with the mesentery and liver, spleen and lungs, continually takes part; and if these organs act inefficiently, the blood is defective, and transfusion can only effect a temporary correction, because, as soon as the transfused blood has been consumed by the continual wants of the system, it is again replaced by blood identical to that manufactured by the defective organs which produced the original defective fluid.

Blood is a constantly and absolutely necessary fluid in the economy of any animal with a circulation; but this does not mean that it has a constantly unchanged nature. On the contrary, it is the universal material which is to furnish to every organ all the materials needed to replace the continual waste, of muscular tissue or fleshy fiber to the muscles, nervous matter to the brain and nerves, phosphate of lime to the bones, etc. Blood is therefore continually in the torrent of its circulation to the most remote parts of the body, being deprived of the most important constituents which it carries; and without an equally continual supply of these constituents, it is soon unfit for further use in repairing the bodily waste. It is thus seen that the cause of poor or diseased blood is not to be looked for in the blood *per se*, but in the organs of which the function is blood making; and if these are defective, no transfusion can possibly be more than a transient benefit, and the attention of the rational physician should be directed to the defective organs in question and not to their result.

THE PREVENTION OF FIRES IN THEATERS.

The recent burning of a theater in Brooklyn, N. Y., was attended with a loss of life under circumstances which render the disaster one of the most horrible ever known. While the last act of the play under representation was in progress, a border—as the hanging piece of scenery used to represent sky, etc., is technically termed—was blown by a chance draft into a gas light. The men stationed in the vicinity saw the accident and quickly cut the burning portion away. They forgot, however, that over the stage below a canopy had been extended to represent the roof of a house, and therefore, instead of falling on the stage, where its burning would probably have done no harm, the ignited fragment fell on this light wooden and canvas framework, and in an instant set it in a blaze. The flames at once extended to the adjacent scenery; and before the audience had fairly become aware of the danger, the fire covered the whole stage.

There were at the time about 1,000 persons in the building, 400 of whom were in the highest gallery. Those who had seats on the lower floors, despite the terrible panic which arose, managed to gain the entrances; but the unfortunate persons above, crazed by fear, blocked the narrow passages, filled the stairways, and then the latter gave way under the weight. The entire crowd was precipitated down into the lobby, and through the burning timbers into the cellar. Meanwhile the fire raged furiously, and in a very short time the walls fell, leaving the theater in a heap of ruins. Although the fire department was promptly on hand, and dozens of persons were fighting the conflagration, no one discovered the frightful loss of life until the following morning, when access to the interior became possible. Then bodies were exhumed in literal masses, packed together tier upon tier like cord wood. Over three hundred, as we write, have been removed, and it is believed that, when all the rubbish can be cleared away, but few of the four hundred who filled the gallery will be found to have escaped.

The reasons that made this disaster possible are threefold: First, insufficient means of egress from the upper gallery; second, absence, it is alleged, of fire-extinguishing apparatus behind the scenes; and third, neglect to render the highly inflammable canvas, etc., fireproof.

It appears that for all ordinary purposes the stairways leading from the gallery were ample. But, as must be the case with all such means of exit under like circumstances, they were quickly blocked by a frantic and struggling crowd. It is scarcely possible to suggest any mode of access to lofty galleries which is not open to the same objection. The apparent remedy is to abolish high galleries altogether, and to allow but a single tier above the ground floor. While high galleries are in existence, however, it is clear that special fire escapes should be provided.

Regarding the second reason, nothing but the grossest negligence can suffice for its explanation. From all accounts a jet from a fire extinguisher, had one been handy, would have put out the incipient blaze. It seems to us that theaters would find a great safeguard in the system of perforated pipe fire extinguishers which we described some years ago. They consist simply in a series of pipes which may run parallel with the gas tubes, occupying but little space and being entirely out of the way. When the water is turned on, it escapes everywhere from the perforations made along the length of the pipes, and drenches the vicinity thoroughly. By this means, aided by some large tanks of water suitably disposed in the roof, a stage and all its appurtenances might rapidly be flooded.

Lastly, and with reference to the third reason, managers will find that they will consult their best interests if they adopt, or at least test, some of the suggestions which inventors have advanced for protection against fire. Canvas soaked in a solution of tungstate of soda will not burn even if held in a gaslight. We have saturated thin gauze with a solution of this salt and failed to make the fabric blaze. This wash might probably be applied to scenery with no more difficulty than the sizing with which every artist covers his canvas before painting thereon in distemper colors. A strong wash of alum might likewise prevent sudden ignition. For permanent hangings, such as are used about prosceniums, there is no reason why a canvas with which asbestos is interwoven should not be used. Asbestos ground fine and mixed with paint gives body to the pigment, and, while not wholly fireproofing the material to which it is applied, might prevent ignition by a chance spark. It would probably be difficult to make canvas covered with a wash of silicate of soda (water glass) catch fire quickly. A wash of green vitriol and alum, applied hot, and covered with a second coat of green vitriol and pipe clay, is said to render light wooden framework fireproof; or instead of wooden frames, light iron frames might be made, which would take up less space, and would be of course uninflammable. Lastly, it is suggested that every theater should have a wire gauze drop curtain large enough to completely cut off the stage and its appurtenances from the auditorium. Such a curtain promptly lowered might effectually check the progress of flames toward the audience. In some theaters in this city, scenes are now painted on wire gauze when intended to be transparent. If plaster were used to fill up the perforations, the gauze might be a valuable fireproof substance to replace canvas, for flats and other scenes attached to frames.

It is a sad task to suggest means of prevention after such terrible damage has been accomplished: all the more so because such means might have been applied had ordinary forethought been exercised. It remains for the public to insist upon such safeguards so strongly that another such dreadful calamity will be effectually prevented. There is scarcely a theater in this city that is provided with sufficient means of egress from its gallery, and not one where just such a fire as lately took place might not occur behind the scenes.

Within the last ten years, nine theatres have been destroyed by fire in New York city alone. This puts the average at about one a year. Meantime, in the other cities of the country, twenty-eight theatres and concert halls were burned. These facts suggest how great are the risks which these structures run, and the need there is of better protection against fire.

REMARKABLE CLOCKS.

We gave, on page 371 of this volume, a description of a clock, which has the odd feature that it oscillates while the pendulum is stationary. The novelty of this clock (the invention of M. Guilmet) is in the form; the principle is old, and clocks may be seen, suspended in shop windows, which oscillate like pendulums, while the escape wheel works on an anchor on the top of a pendulum rod, which, however, in place of being movable, is fixed in the table under the clock, making it stationary; while the escape wheel, by the reaction of the pressure on its teeth upon the anchor, moves to the right and left, and communicates this movement to the whole clock. Usually the suspension rods of these clocks are of such a length as to make the whole clock a seconds pendulum; and these rods are composed of bars of steel and brass, to compensate properly for changes of their length by temperature. In this case, these clocks are, if well made, excellent time pieces; and they are often used by watchmakers as regulators.

Another remarkable kind of clock which recently has been imported, and put on exposition in New York city, consists of a glass disk with the figures of the hours on it and hour and minute hands loosely slipped on a pivot in the center. The hands can be taken off, and no works whatever are visible, nor can any connection of the hands with anything be seen, notwithstanding that the hands point always to the right hour and minute; and even when turned round or even whirled by hand they will, after some revolutions and oscillations, come back to the right place. They are well called mysterious clocks, and spectators are assured that they are not moved by electricity. This is true; and the whole secret is in the counterpoise of the hands, each of which has a heavy arrow point at the long end, and at the short end a hollow round box. In this box are the works of a watch, which are so placed as to leave an annular space between them and the circumference of the box; and in this space is a counterpoise which is connected with the works so as to revolve once in 12 hours for the hour hand, and once in an hour for the minute hand; the revolution of the counterpoise inside the box shifts the center of gravity of the hand, so as to give the hand, successively, the necessary direction. Thus, when the counterpoise is the furthest from the axis, it brings the center of gravity opposite the arrow point, and the hand will point upward to 12; when, on the contrary, the counterpoise is between the axis and the arrow point, the center of gravity will be there, and the arrow will point downward, to 6. In the intermediate sideward position of this revolving counterpoise, the center of gravity of the whole will be displaced sideways, and the hand point at 8, 9, 10, or 2, 3, 4, according to the shifting.

This clock was patented in this country on September 1, 1874, by Henry Robert, a clockmaker of Paris, France. Lately Mr. Robert has considerably improved on the plan, especially by using very light and very heavy metals in combination, so as to have a sufficient contrast in weight for obtaining the right effect. The hidden counterpoise, moving in the hollow box, is of platinum, so as to take up as little room as possible, and the hand with its arrow point is of aluminum, the lightest known metal

THE CREMATION OF BARON DE PALM.

It is not exactly clear what the gentlemen who invited a number of physicians and scientific men to visit an out-of-the way little Pennsylvania town, and there to witness the burning of an embalmed corpse, expected to prove by the operation. The deceased, an eccentric person named Baron de Palm expressed, before dying, a desire to be cremated. His equally eccentric executors felt morally bound to accede to his wishes; but instead of quietly and decorously burning the body, say in any gas retort or puddling furnace, they used a special apparatus constructed in the village aforesaid, after lavishly advertising the show and themselves for several weeks in advance. In the presence of a crowd, numbering very few scientists but very many newspaper reporters and morbid sight-seers, the withered corps was placed in an iron basket, shoved into a retort heated to 2,306°, and in three hours it was reduced to ashes. Cost, ten dollars.

We venture to think that most people, even before this experiment took place, knew that a human body can be incinerated at the above high temperature in a brief space of time: and that it is no difficult matter to lead away evolved gases. Hence we fail to see wherein the much vaunted scientific interest of these crematory proceedings existed. So far as their effect upon the public mind is concerned, the sentiment left after the perusal of the published details of the burning and of the scenes attending it will savor strongly of disgust.

WHO DISCOVERED THE CIRCULATION OF THE BLOOD?

Strictly speaking, it was not one brilliant stroke of genius or good fortune, but a long series of investigations by different hands, which resulted in a true understanding of the circulation of the blood. And as with most epoch-making achievements in Science, so with this: while no one experimenter or thinker can certainly be credited with the first clear perception of the new truth, fame has given, and perhaps justly, the laurels to the man who was able to compel its acceptance by an unwilling world.

For two centuries that credit has been given to Harvey, for his masterly demonstration of the mechanism of the veins and arteries, and his not less masterly advocacy of the new doctrine. It is not as clear, however, that he was absolutely the first to detect and describe the true office and character of the circulatory system. It is certain that the nature of the pulmonary circulation was understood and taught by Italian and other physicians before Harvey's studies began; and more than a hundred years ago Moreri claimed that the honor of discovering and demonstrating, by experiment and reasoning, the nature of the greater or systemic circulation was really due to the Italian physician and naturalist Andrea Cæsalpin, commonly called Cesalpinus, who published his "Exercitatio Anatomica de Cordis et Sanguinis Motu," in 1628.

Lately Professor Ceradini, of Genoa, has renewed the claim so successfully that a monument has been erected to his countryman's honor in Rome, and a tablet recording the discovery is to be fixed to the portals of the University of Pisa, where Cesalpinus taught before he removed to the neighborhood of the Vatican, as physician to Pope Clement VIII. There is no proof, however, that Harvey knew anything about the work of his predecessor and rival, whose book does not appear to have received much attention even at home. And there is no question of the fact that the doctrine was first publicly discussed and combated as Harvey's, in Europe as well as in England. Within a century of the death of Harvey, it must be remembered, the father of modern physiology, Haller, revived the whole controversy, and gave a verdict in favor of the English physician. Holding that the true discoverer of any truth is he who draws it from its sources "at his own risk and by his own meditations, and establishes it by arguments so forcible that they convince those who are longing for the truth," Haller decided that "not to Cesalpinus, on account of a few utterances of obscure meaning, but to Harvey, the laborious author of numerous experiments and the expounder of all the arguments which, in his time, could be advanced, belongs the immortal glory of the discovery of the circulation of the blood." As Haller was not a countryman of either claimant, there is no reason to suppose his decision other than impartial: and whatever Italian pride may lead to, it is altogether likely that the rest of the world will continue in the belief, so long entertained, that Harvey's fame was fairly won.

BINDING OF NUMBERS.

IMPROVED SOLAR PHOTOGRAPHIC APPARATUS.

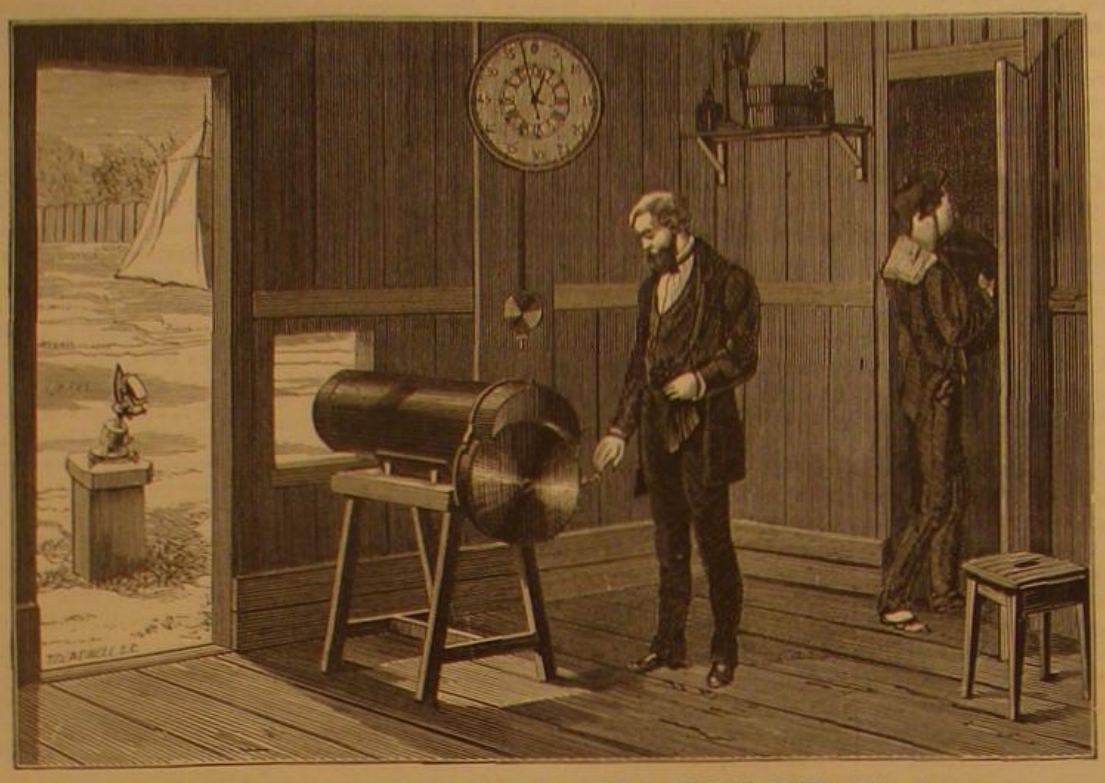
In our recent articles on the supposed planet Vulcan, we noted the suggestion, made by the celebrated physical astronomer, M. Janssen, that at certain observatories a continuous photographic record of the sun's face should be kept, so that if by any possibility Vulcan should make a transit, the fact would be indelibly stamped on the record. For this purpose, the revolving photographic apparatus, formerly used during the transit of Venus, was proposed. This machine works automatically, and goes on taking dry plate photographs until it runs down.

The apparatus is represented in use in Fig. 1, and its detailed parts are shown in Figs. 2, 3, and 4. It is fixed at the extremity of a long wooden telescope which serves as a dark chamber. The telescope is mounted on a heliostat, which is moved by clockwork so as to follow the sun.

The construction is as follows: On a common axis are mounted: 1st. A copper disk, C, Figs. 2 and 4, fixed on a wheel engaging with the pinion of a clockwork train, M. 2d. A large wheel, R, carrying a plate of silvered copper, P, which receives the images. On the disk, C, are made twelve openings, F, Figs. 2 and 4, equally spaced. This disk makes its complete revolution in 18 seconds, while the wheel carrying the Daguerrean plate turns with one fourth the velocity—that is, once in 72 seconds.

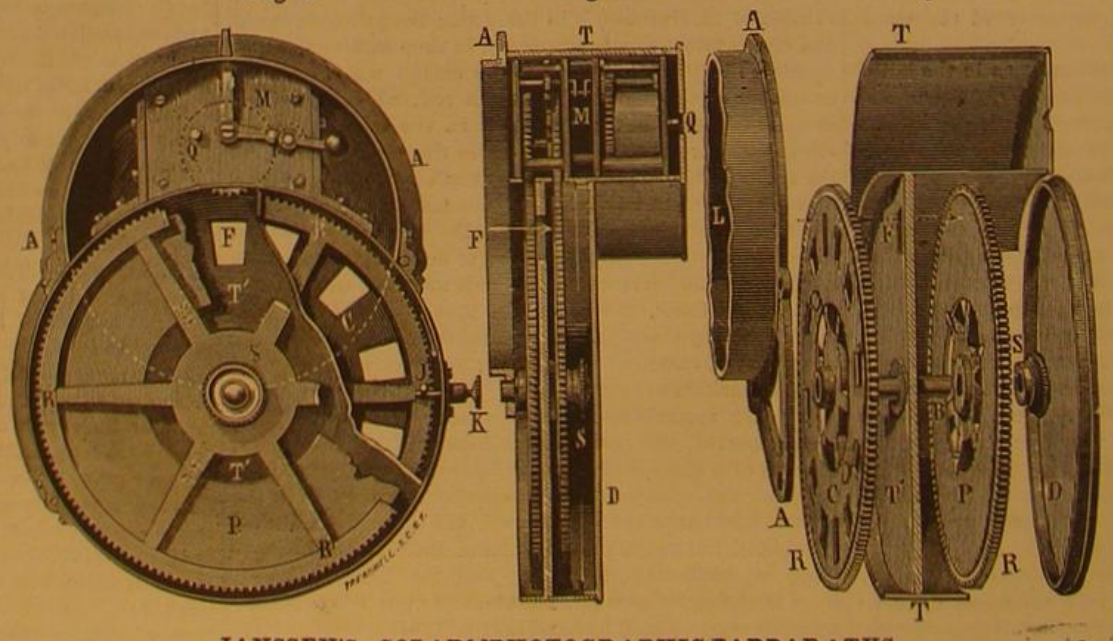
In any photographic operation there are three processes: The opening of the light aperture, the posing, and the closing of the aperture. The disk, C, is the obturator, which opens and closes the aperture, while the plate, P, comes in place to receive the image. The three operations are accomplished in one second and a half.

The plate wheel, R, is governed by a Maltese cross wheel, which allows it to move over a certain part of its revolution, and then permits it to stop for a brief period. This stoppage occurs just as one of the openings, F, in the disk, C, comes in focus of the dark chamber. The other details of the instrument are as follows: O is a square for mounting the clock movement; F is the passage of the luminous ray and focus of the telescope; M, Fig. 2, is the connection of the clockwork wheels with those carrying the photographic plates and obturator; T and D are drums and plates for closing the photographic chamber exactly, and L is the tube of the telescope.



JANSSEN'S SOLAR PHOTOGRAPHIC APPARATUS.—Fig. 1.

Fig. 2. Fig. 3. Fig. 4.



JANSSEN'S SOLAR PHOTOGRAPHIC APPARATUS.

A Single Track Railroad.

The San Francisco *Examiner* of November 25 says: "Yesterday the steamer Sonoma conveyed to Norfolk, on Sonoma Creek, a number of our prominent citizens, who assembled to witness the opening of the Prismoidal Railroad. The road commences at Norfolk, on Sonoma Creek, and extends three and a half miles towards Sonoma. The steamer arrived in good season at Norfolk, on Sonoma Creek, the terminus of the Sonoma Valley Prismoidal Railroad, where the party landed, and at once proceeded to inspect the line and the works generally. The Prismoidal Railroad is laid upon a prism of wood built of beveled boards, forming a continuous prism 27 inches wide at the base and 15 inches high, with the single rail laid on the top. The car which travels on the line is supported by two wheels, one at the front and one at the rear, with independent revolving flanges. On arrival, the first thing to be done was to test the road, and in a few minutes platform cars, with a prismoidal railway locomotive between them, were at the stations. The locomotive is the first of its kind constructed in this State, and was built under the superintendence of George W. Fogg, of the Pacific Iron Works. The party took their places on seats which were ranged on each side of the cars, the passengers being face to face. The first impression suggested was that which ordinarily fills the bosom of the novice who makes his maiden effort to ride the uncertain bicycle. A certain assurance that the whole thing would topple over at the first movement was the general belief of the uninitiated. But the engineer sounded his whistle, the passengers gave their tremulous cheers, and the train moved off smoothly, and soon the pace was considerably augmented. Wonderful to relate, the oscillation was scarcely perceptible, and the locomotive and cars rode the single rail as firmly as the trains on the broadest of English solidly constructed broad gages. The faster the train proceeded, the smaller in number and extent became the lateral oscillations, beautifully and practically exemplifying the great principles of the whole prismoidal system, that the greater the speed, the less the liability to oscillate, a principle clearly demonstrated by the gyroscope and velocipede. To those making their first trip on the new railroad, the ease and comfort of this mode of traveling suggested itself most strikingly. The train was run out to the end of the completed line, where forty-five men were found continuing the building of the prism onward. The construction of the road has cost, for the present three miles and a half, including the cost of the road bed over the marsh, about $4,500 a mile, one half of the cost of the narrow gage railroad, the most economical of the two rail system. The road was commenced on the 16th of August last by the building of the road bed.

A New Rural Swindle.

The "granger" is now the object of a new swindling dodge, which deserves the palm for ingenuity. A substantial looking person, perhaps with a companion or two, drives up to the door and announces himself as a large butter dealer or agent of some large concern. He inspects the granger's dairy and stock of butter critically, and finally enters into a contract to buy all the butter the farm can produce at some exorbitant figure, say fifty cents a pound. The reason he gives is that butter is on the rise, supply is limited, demand never so heavy, he is willing to pay to insure a good stock, etc., etc. Then he departs, and the granger revels in dreams of affluence.

In about a week, along comes a herd of milch cows on their way to some other village. They stop to rest near the granger's house. He is especially interested in cows just at present, is of course anxious to add to his dairy facilities, and so he talks about purchasing to the drover. The latter don't want to sell—these animals are choice stock—can command fancy prices—all butter cows, etc Granger bids high—higher, and finally, as a great favor, is permitted to buy a few animals at an exorbitant figure. Then the herd moves on. After a while the granger discovers that he has purchased some very indifferent beasts. He also learns that several of his neighbors have done likewise, under like motives. But neither he nor his neighbors ever hear of the butter dealer again.

Cleansing Wool.

M. C. Hammelrath announces that he has succeeded in making the following improvement in the process of wool-cleaning, which consists in dissolving in 66 gallons of hot water, 39 lbs of caustic soda of 60° to 76° Baumé, and then adding 22 lbs. of white resin or colophone, boiled for half an hour. This must be done in an enameled metal or wooden vessel. The rest of the process is as usual, the wool being rinsed in water after cleansing. The quantities given above are about sufficient for 2 tuns of wool, but this depends upon the quality of the latter.

Musical Sand.

On page 154 of our current volume, we should have said that the microscopic examination of the sand was made by Professor Blake, and not Mr. Frink, as stated. In a recent communication to us, Mr. Frink says: "I do not coincide with him (Professor Blake) as to the cause of the sound. There are two ways in which the sound could be produced, which suggest themselves to me: 1. From the peculiar forms of the cavities in these coral sands, each and every cavity is sonorous like a hall, and multiplication of these unnumbered millions of voices produces the imitation of the rumbling of distant thunder. Or, 2, that the passage of air through the cavities causes the walls to vibrate like the reeds in musical instruments." Mr. Frink brought with him from the banks in Ranai, Sandwich Islands, two closely packed bags of the sand, each bag contakning 90 lbs. In San Francisco, the isand was apparently as sonorous as when taken from its native banks; but after a railroad transit of two thousand miles, to Illinois or Iowa, it seems to have wholly lost this property. This is very probably due to the dampness of the elements. Mr. Frink continues: "As to the origin of the sand, none of it is sonorous except the coral, and that is from a peculiar species. On the island of Nihau, twenty miles from Ranai, there is a similar bank. There is one bank near Kalou, on the island of Ranai, that is partially sonorous, but the sand is mixed with so much other coral that the sound is very weak. This bank is more than thirty miles from the others, but on the same island."

Mr. Frink kindly offers to supply any one, wishing to investigate the subject, with a suitable quantity of the sand. On the Pacific coast, as has been stated, if a pint bottle, half filled with the sand, or shaken rapidly up and down, so as to drive the contents quickly from one end to the other of the vessel, a distinct musical sound could be heard; but after transportation to the inland States, the sand failed to respond when similarly treated. Having received a portion of this sand, we subjected it to the following treatment: When shaken in a bottle, as described, we could not detect any marked difference between the noise produced by it and that of ordinary ocean sand, of the same sized grains, under the same conditions. Both kinds of sand were then dried in an evaporating dish at a temperature of 100° C. (212° Fah.), and allowed to cool in desiccators over sulphuric acid. When the experiment was repeated with the dry sand, we had no difficulty in recognizing the coral sand by the peculiar sound produced. A large bottle, with a long body and narrow neck, was employed, the open mouth being connected, by means of a piece of flexible rubber tubing, with a small funnel, which was placed to the ear when the bottle was shaken. The same experiment was tried with a wooden vessel in place of the bottle. The sound is without doubt produced, at least in part, by the reverberations from the walls of the little caverns and the vibrations produced in the air itself, as in an organ pipe. The accumulation of all these little echoes and pipings would, we think, in the aggregate, amply suffice to produce the subdued roar, the statements of which, we are assured, have not been exaggerated.

The grains of the coral sand are somewhat larger than ordinary sea sand, their average dimensions being about one millimeter (0·039 inch). They consist principally of carbonate of lime, and of course dissolve almost completely in dilute acids. The little pebbles and variously colored shells form very interesting objects under a low power microscope.

COAL TAR A PRESERVATIVE OF WOOD.—We often notice that coal tar is named as a preservative of wood, and the comment is correct if those who advise would add that, in using, it must have the acid in it destroyed by mingling fresh quicklime with it. Half a bushel of lime, freshly dissolved and mingled with a barrel of tar, has kept posts, saturated with it and planted in clay ground, perfect over 20 years.—*F. R. E., in the Cultivator and Country Gentleman*

ENGLISH CHEESE--ITS MANUFACTURE.

Probably the best as well as the most famous English cheese is Cheddar, the excellence and sweetness of which depends as much upon the management of the processes of manufacture as upon the quality of the material used. It is made principally in Somersetshire, and is produced in the following manner: The evening's milk is placed in cooling vats so that it will be brought to a temperature of about 60° by the following morning, when the morning's milk is added, and the temperature raised to about 80°. The large vat which contains the milk is gently heated in the water bath; and when the milk reaches the last mentioned temperature, sufficient rennet is added to cause coagulation in about forty minutes. Some whey is added to hasten the development of lactic acid, and finally, when the curd has become sufficiently firm, it is cut with curd knives. It then contracts rapidly, expressing the whey; and in about twenty minutes it becomes quite firm, when it is broken into small pieces by a wire shovel breaker, and the temperature raised to 98°. The whey is now drawn off, and the curd left for about twenty minutes longer, when it becomes a coherent, partially solid mass.

When firm enough, it is removed, broken into thin flakes, and spread out to cool. After the lapse of another twenty minutes, it is turned over and left until it attains a peculiar mellow and flaky condition, well known to the experienced cheese maker. By this time the temperature has been reduced to about 70°. The curd is now put into a hoop and pressed gently for about fifteen minutes to drive out the whey, by which a too rapid fermentation is prevented. It is then taken out, cut into small bits by a curd mill, and then salted with 1 lb. of salt to 56 lbs. of curd.

The curd is now again placed in the hoops and kept under process for from 20 to 24 hours. It is then removed and the sharp edges pared off, after which it is turned, bandaged, and put in the press again for a day or two longer. The temperature at which it goes to press is a matter of great importance, because, if too high, fermentation with evolution of gas is liable to take place and make the cheese porous. Cheddar goes to press at about 65°. While in the curing room, which is kept at 70°, the cheese is rubbed with melted butter and turned over daily.

Cheese is usually classified into cream, whole milk, skim milk, and sour milk cheese. To the first class belong Stilton, cream Cheddar, and Cotherstone. Whole milk cheeses are Cheddar such as above described, Cheshire, best Gloucester and Wiltshire. Some Gloucester and Wiltshire cheeses are made of skim milk. Sour milk cheese is principally Dutch.

A great cheese fair was recently held in London, England, and of this we give several illustrations, for which we are indebted to the London *Illustrated News* A large cheese vat is represented, capable of holding 500 gallons of milk. The men are engaged in what is technically termed cutting up the curd, an operation effected with a kind of rake. The steam required for heating the milk and other purposes connected with the manufacture was supplied by one of Burford & Co.'s steam generators. Another illustration shows the curd mill at work; after which we have what is called the filling-in of the vats: that is to say, of the molds from which the cheese takes its particular form. The cheese presses, also shown in our engraving, are the same that the Aylesbury Dairy Company use in their factory at Swindon.

In the cream and butter section of the Company's stall three fifty-gallon creaming tins, of a special pattern and each giving a skimming surface of twenty square feet, were exhibited. Churns, too, were seen at work as represented in the engraving, which also shows the system of making up the butter in pats. Upwards of 300 lbs. of this butter and more than half a tun of cheese were made at the Aylesbury Dairy Company's stall, during the few days the show continued open, from the milk of the cows exhibited.

CHEESE AND BUTTER MAKING AT THE LONDON DAIRY SHOW.

Needle Making.

The *Journal of the Society of Arts*, London, gives the following account of the processes which every needle has to go through in its process of manufacture:

Redditch, in Worcestershire, England, and Aix-la-Chapelle, in Germany, it states, may be regarded as the seats of the needle trade of the whole world, comparatively few needles being made elsewhere; English needles are, however, more in request than those of any other country. As the needles undergo a considerable number of processes, from the rough steel wire to the highly polished hand instrument, which is not yet superseded by its machine competitor, perhaps some account of their manufacture may be found not uninteresting.

The steel wire, which must be of excellent quality, being hand-drawn for best needles, is first cut into lengths capable of making two needles each. This operation is performed either in bundles, by means of hand shears, or four at a time in self-acting machines, the shears of which are worked by an eccentric while the wire is fed up to them. The two-length pieces of wire are then formed into bundles from three to five inches in diameter, according to the size of the wire, and held together loosely by a pair of iron rings, in which state they are annealed in a furnace heated by a wood fire. When sufficiently soft, the wires, still in bundles, are rolled over one another by the aid of what is termed the smooth file, and thus made to straighten each other.

The next operation, that of pointing on grindstones, formerly involved greater loss of life than any other industrial occupation. The needles (twenty-five at a time) were made to rotate against the stone between the fingers and thumb of the operator; and the subtle dust from the stone and the needles was inhaled with the breath, and found its way into the lungs, causing the malady known as grinders' asthma, to which all grinders succumbed at an early age. All this is now changed, however. The needles are made to rotate between two india rubber bands traveling over the concave face of the grindstone, of special quality, obtained from Frankfort; and the fine dust is carried off through a channel under the grinder's seat, by an exhausting fan, which does duty for all the stones.

The middle portions of the wires, now pointed at both ends, are next brought under a falling die, worked by the foot, which stamps the gutter for the eye, roughs out the heads, and marks the position of the eyes. The flattened portion has become hardened by the blow, and this hardness has to be removed in the annealing oven. The holes for the eyes are then punched out by a pair of small punches in a hand screw press; these punches require careful workmanship, both in making and adjusting, and employ special operatives, who work with magnifying glasses like those of watchmakers. A number of the pairs of needles, still united, are then threaded or spotted, as the term is, on a pair of fine wires; and the burr or fin, made in stamping the heads, is then removed by a file After the lengths have been divided, by bending the wires backwards and forwards between the two spits, the rudely formed needles, now for the first time separate, have their heads rounded off by filing, especial care being taken to avoid weakening the eyes.

The needles are next heated in small iron trays, and then dropped separately into cold oil, which makes them very hard; they are then tempered by being heated on a hot plate, or in a charcoal stove, until a dark blue film forms over them. These two operations cause some amount of warping, to counteract which the needles are straightened by hand hammers on small anvils. To ascertain if they are straight, the needles are rolled by the finger on a smooth steel plate, and such as do not run smoothly are again straightened with the hammer.

The next operation is scouring, to remove the black coating, and give the needle that high polish which is necessary to enable it to pass readily through the fabric. Formerly, from seven to eight days were occupied in the case of best needles by this one process; but now the time is considerably shortened, owing to improvements in the appliances. The needles are weighed out into lots of from 400,000 to 500,000 each, according to size, and tied up with emery powder, oil, and soft soap, in a square piece of strong canvas, and securely bound with cord, thus forming rolls or bundles about two feet long and three inches in diameter. These bundles are rolled backwards and forwards in the scouring machine under a heavily weighted slab worked by cranks driven by the engine. This process is repeated from seven to eight times, according to the quality of the needles, the needles being washed in soapsuds after each scouring. The final polishing is accomplished in the same manner, but with putty powder, and the needles are then dried in ash wood sawdust.

The needles are now highly polished and well tempered, but with the eyes not yet perfect. The heads are all arranged in the same direction by gradually bringing them up to the edge of a board, and letting the heavier heads fall over, so that they may be taken up and turned the other way;-this is done by means of a couple of metal plates, as touching the needles by the hand would cause them to rust. For picking out defective needles, which must be done by hand, an operative of the gentler sex is chosen, whose hand is cold and dry. Before the eyes are drilled, they are softened or blued, by being made to pass through a gas flame by means of a revolving wheel, which picks them up by an ingenious

arrangement. This seems to be the only process where any inconvenience is felt by the operatives, who complain of headache after remaining for any length of time in the room where several of these gas flames are burning. The withdrawal of the fumes from the gas by a hood and exhausting fan, like that used for the grindstones, would obviate this inconvenience. The eyes of the drilled eyed needles are smoothed by a fine countersunk drill of delicate workmanship, several drills being driven by one pulley. The eyes are polished by being again spitted on wires smeared with emery and oil, and hung in a frame made to travel backwards and forwards by the engine. As the wires are stretched in a direction oblique to the line of motion, the needles are shaken about in different directions so as to effectually round out the eye. Both heads and points are finished on small grindstones of very fine texture, a number of needles being rolled together between the finger and thumb, then polished in the same manner on emery buff rollers.

After passing through these multifarious operations the needles are at length quite finished, although some extra qualities now have their eyes gilt by the electrotype process; all that remains to be done is to put them up in packets, generally containing a quarter of a hundred, ready for sale. The better kinds are stuck through strips of cloth pasted o the paper; but even with the commoner kinds an improved wrapper has lately been devised, which enables one needle to be selected without the danger of all the rest falling out of the packet.

How We Lived: 1861--1865.

The following, under the above heading, in the *Semi-Tropical*—an excellent magazine, published at Jacksonville, Fla., devoted to the industrial resources of Florida—offers some striking exemplifications of the old saw: "Necessity is the mother of invention." It shows besides that, in point of ingenuity and fertility of resources, our Southern countrymen are not a whit behind their Yankee brethren. The period referred to is of course during the war, when the blockade had cut off supplies, and business in the Confederacy was practically at a standstill:

As time wore on (says the writer) and scarcity became absolute, people were forced to find substitutes in the articles produced here, for the then unobtainable things formerly used. But, with ingenuity and experiment, they succeeded so well that most were able to get along comfortably. For coffee, wheat, rye, barley, corn, sweet potatoes, roasted and ground, were substituted; for tea, sassafras, sage and the leaves of the yupon were decocted. The ashes of corncobs dissolved in water made a firstrate soda or "sea foam" for baking; peanuts were used for coffee and pressed for sweet oil. The barks of trees and shrubs, the roots of sarsaparilla, ginsing, and other medicinal plants indigenous there furnished medicine. Nutgalls and pomegranate skins made a good dye or ink; the china berries a polish for leather; agricultural implements, harness and household furniture became of primitive make; wood plows, rawhide harness, bear grass lines and ropes, corn husk or moss collars, wooden pins for nails, cypress knees and gourds for buckets and smaller vessels, and hide-seated chairs were soon the generally used articles; rude spinning wheels and looms were common and were to be seen in every house almost, where the family spun, knit, wove, and colored cotton and wool; many a new dress was woven from the threads raveled from an old silk dress laid aside in former years; palmetto was readily appropriated for thatching or even constructing houses, and women's ingenuity braided it for gentlemen's hats, as also for a *love of a bonnet*, trimmings and all; with dyes made from the forests and field, the ladies were able to fashion their wear usefully and with taste. Lightwood was the ordinary light; tallow candles a grade higher, and the berry of the wild myrtle furnished way tapers for bridal and religious celebrations. Ashes furnished the potash for soap, and the palmetto stalk was excellent for scrubbing and washing; the coonta and arrowroot served for food, starch, and in sickness. The ladies were most ingenious in making their own shoes; taking an old, worn-out pair which had been cast aside in former days, they would pick out the threads of sole and top, and, using the latter for patterns, make a genteel boot; and when flour got scarce, with meal ground fine they would make fruit cake with home-preserved citron, dried grapes, and cane sirup.

Nor were these improvised novel industries confined to the wants of the household. A very palatable beer was made from corn, from cane and roots; even liquor was distilled from hitherto unusual materials. Oranges, blackberries, plums, peaches, persimmons, sugar cane, were easily procured, and rude, simple stills constructed, sometimes on the smallest scale: the writer remembers on one occasion, traveling in Leon county, seeing a smoke on a small branch near the road; going to it, he found an old, one-eyed fellow, with his apparatus, consisting of a five-gallon pot with a wooden cap, which contained the mash of wild plums; three old musket barrels joined together conducted the vapor through a wooden trough filled with water, thus condensing it; from the end of the gun barrel slowly trickled the unrectified poison into a rude bucket—poison quite as destructive as the powder and ball which it originally carried. This crude liquor sold readily at one hundred dollars a quart; the daily product was some two quarts; the skimmings of boiling sirup were distilled into rum; the production of liquor, however, was very limited, the stuff mostly appropriated to the hospitals. Drinking intoxicating liquors almost entirely ceased, and the usual results of quarrels and disturbances were unknown.

The absence of the doctors in the army left the country without medical advice, and the scarcity of medicine afforded no opportunity for people to be dosed or to drug themselves, except with simples and herbs; and though it may have been exceptional and providential, there was no contagion or epidemic and very little sickness of any kind, and the mortality was less than ever before or since; plain food, temperance in eating and drinking, exercise and industry, no doubt assisted in causing general health.

Most of the newspapers were suspended: no news of the day, domestic or foreign, except occasionally when a return soldier or blockader brought papers. At first the want of salt was seriously felt, but soon salt works were established on the coast; mill boilers and sugar kettles being used to boil the sea water, and a supply afforded.

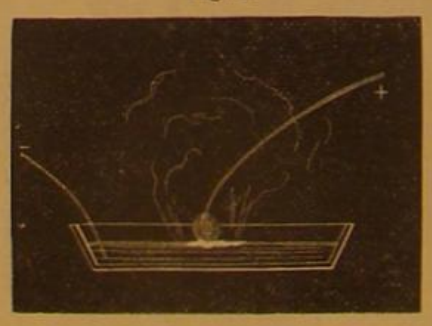
In looking back to those days, one is surprised at the latent resources developed by the people of the South. Up to that period there was scarcely an article, even the most common and simple, that was not brought from abroad: the christening robe, the shroud, and the coffin were of foreign make; agricultural and mechanical implements, from the ax helve to the cotton gin, came from the North; even the peculiar staples, grown only there, first went abroad, and were then repurchased and returned for consumption. In all Florida there were no manufactures, except the most simple and rude, on plantations. The largest towns seldom had even a blacksmith shop; tailors, shoemakers, harness makers, and wagon makers were unknown.

Jacksonville, before the war, with twenty first-class saw mills and an abundance of good clay, imported laths, planed lumber, and bricks for building purposes. War closing our ports and stopping our intercourse with the North and foreign countries, the Southerners, with true American spirit, went to work to put to use the hitherto dormant materials always present in the country; and if the war had been further protracted, they would have cultivated and manufactured, no doubt, all articles needful for the most advanced nation. Nor was the lesson or experience of the war times lost, for since 1861 manufactures have increased rapidly; agriculture has become diversified, and the South self-sustaining in provisions, and she will soon be independent in all manufactured articles.

M. PLANTE'S THEORY OF THE FORMATION OF HAIL.

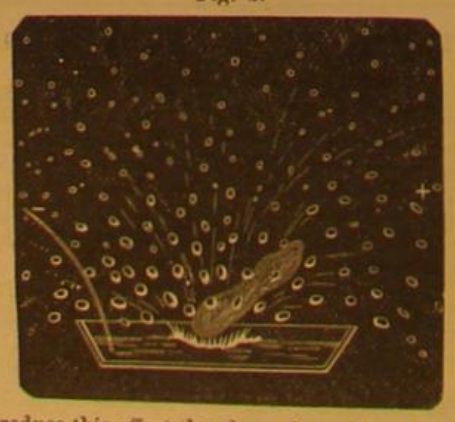
M. Planté considers that atmospheric electricity, in the state of a discharge or dynamic flux, produces a powerful calorific action capable of vaporizing water in clouds rapidly, and of projecting the vapor so formed into the cold regions of the atmosphere. In order to show the effect of the electricity in this phenomenon, it will suffice, he says, to mention the mechanical action which takes place on the passage of the electrical discharge through aqueous masses, and the projection into the air of liquid globules susceptible of becoming transformed into hailstones. With a source of intense voltaic electricity, the immersion of the positive wire into a conducting liquid, such as salted water, determines the aggregations of the aqueous molecules around the electrode, in the form of a luminous spheroid. This is due to the double simultaneous effect of scattering and aspiration which appears to be peculiar to the electric discharge. The appearance of the spheroid is clearly shown in Fig. 1.

Fig. 1.



If a more intense current be employed, coming from a battery of 400 secondary couples, instead of a single globule at the positive pole, a cluster of innumerable globules is obtained, which succeed each other with great rapidity, and which are projected for more than three feet from the vessel containing the water. The spark produced at the same time at the surface of the liquid appears as a corona or aureola of many points, from which the aqueous globules escape. This phenomenon is represented in Fig. 2.

Fig. 2.



To produce this effect the electrode need not be of metal. A piece of filtering paper, moistened with salt water, in communication with the positive pole causes a like result, and constitutes a humid mass analogous, in certain measure, to that of a cloud whence an electric discharge escapes. If in place of meeting a deep layer of liquid, the current simply comes in contact with a damp surface, such as the sides or bottom of the vessel, the calorific effects predominate, the aureola is more brilliant, and the water is rapidly transformed into steam. This experiment is represented in Fig. 3.

Fig. 3.

It thus appears that the action of the current differs according to the resistance opposed to it, and thus here is found a new example of the reciprocal substitution of heat and mechanical work resulting from the electric shock. When the work represented by the violent projection of the liquid was visible, neither heat nor steam was developed; but when this does not take place, the powerful calorific effects at once are noticeable.

From these experiments M. Planté concludes:

1. That electric discharges produced in clouds may, according to the more or less great density of the moist conductors, determine their reduction into vapor or their instantaneous aggregation into globules of volume much larger than the cloud globules themselves; and that the liquid bombs thus formed may be projected to great hights, where a very low temperature prevails.

2. That the formation of hailstones, in cases where they do not present a series of opaque and transparent layers, but a radiating structure, is also explained by this mechanical action.

3. That the ovoidal or pyramidal form of the stones, as well as their protuberances, asperities, etc., are due to their electrical origin.

4. That the light sometimes emitted by hailstones is also due to electricity, the discharge producing them rendering them at the same time phosphorescent.

Correspondence.

Steel.

To the Editor of the Scientific American:

For years I have noted very many valuable hints and suggestions in your paper as to how to work the above problematical substance. Appreciating these, and having profited by them, I wish to tell my own experience in the hope that it may help some poor unlucky mechanic over a rough place. Twelve or fifteen years ago, when I wanted cast steel for any purpose, I went to the hardware merchant and purchased a piece that would serve my purpose best, with the very least forging, that is, I got the nearest size, to the one I wanted, which I could find. If too small I could "stove" it a little; if too large, it was drawn. But after a while I found that some steel would make springs for gun locks, knife blades, surgical instruments, etc., with but a few failures, probably one in one hundred; while with other pieces, I could not make one spring in a dozen stand. The first fact I was able to discover was that every piece of steel that gave me trouble was clean and new. For a year or two after, I avoided this clean pigeon-blue colored article; and I bought anything that was rusty, regardless of size. This naturally led me to suppose that my trouble was all located in an article lately put upon the market. But as time corrodes all things, all the pieces of steel kept by the dealers became more or less rusty, and I was no longer able to pick out the rusty steel that used to be good, or discard the clean and bright blue as bad: and so my rule, that had served me well, died a natural death. At last it occurred to me to examine the qualities of steel under a glass. This I did, and found the one that gave me trouble was coarse in grain, showing large crystals, with spaces between (like those in burnt steel); while that which gave no trouble was fine in grain and seemingly perfectly homogeneous throughout.

When I go to buy steel now, I carry my little glass in my vest pocket. I don't know the power of it, but I do know that it saves me a power of work and vexation.

Minneapolis, Minn. G. W. TINSLEY.

Ventilation.

To the Editor of the Scientific American:

The want of ventilation in a superheated room is quickly noticed by those accustomed to the old-fashioned fireplace, and the accumulation of dust in such rooms is annoying. Having recently begun to use a stove, I made a sheet iron door, two feet wide and of the hight of the arch, which can be opened so that the draft up the chimney can readily clear the room of dust, smoke, or vitiated air. An ordinary stove flue might be built so as to have a similar opening at the floor; it would serve as a ventilator, and as a means of withdrawing dust, etc. G. W. W.

MR. EMIL BRUGSH, Chief Centennial Commissioner from Egypt, and Secretary of the Board of Awards on hydraulic apparatus, has recently purchased one of the Valley Machine Co.'s bucket plunger steam pumps for his own use, in Egypt

IMPROVED SEMOLINA SEPARATOR.

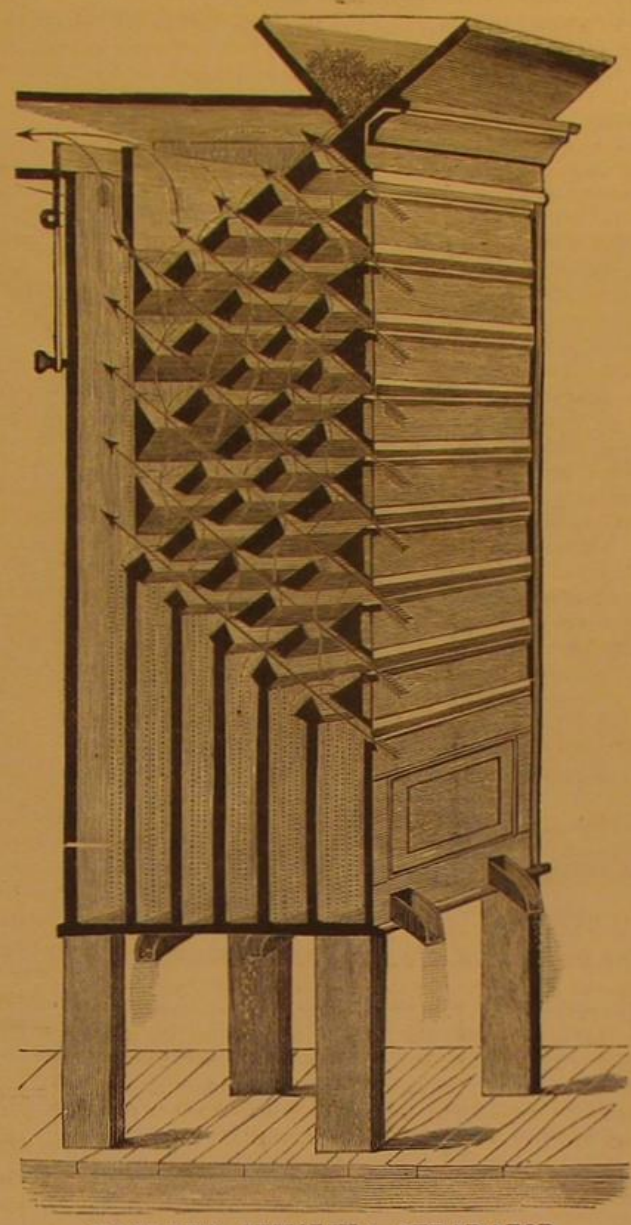
This machine is of somewhat peculiar construction, and its action will be readily understood by reference to the annexed engraving, extracted from the English *Miller*. The apparatus is represented without the sizing sleeves. The semolina enters the hopper, and falls upon the first inclined shelf. In its passage down, the semolina is acted on by a current of air, as indicated by the upper arrow; the light flocculent particles are carried up to the exhaust fan (see the large arrow), the intensity of the current being regulated by the adjustable slide. There are nine air inlets: the heaviest semolina will thus fall through no less than nine currents. The lighter and inferior semolina passes down to the next shelf, and is again subjected to a current of air, until the whole of the semolina passes down to the next shelf, and is again subjected to a current of air, until the whole of the semolina is separated and deposited in the respective spouts, according to its specific gravity; the dust and branny particles are drawn upwards by the fan, in the direction indicated by the points of the arrows. There are thus six separations made—two sorts of the heaviest and two of the lighter semolina, one of branny particles, and one of light dust. The apparatus shown in the engraving is 8 feet 3 inches in hight, by 3 feet 3 inches wide, by 2 feet. The machine offers an interesting illustration of the adaptation of air to the automatic separation of such a delicate substance as semolina, so that every atom could be held in suspension, balanced, and finally deposited into the various divisions of the apparatus exactly in accordance with the respective specific gravities of the particles of semolina, etc., operated upon.

Why Silks Break at the Folds.

Formerly the silk manufacturers used ungummed silk both for warp and weft. The ungumming softens the silk, and removes from it a resinous matter, but there is a great loss of weight: in French silks 25 per cent, but in Chinese silks sometimes 40 per cent. The manufacturers have, for some time past, ungummed merely the silk for the warp, leaving that for the weft raw, as the threads of the warp are not seen. In this manner a great loss of weight is avoided; but the goods, as soon as wetted, become uneven. This happens especially where such tissues are dyed, when the weft is attacked by the color and the mordant, and becomes rough and broken. Like all other fibers, that of silk consists of a number of small particles linked together. These become prominent on ungumming; so that when a silk fabric, consisting entirely of ungummed silk, is moistened, no alteration appears. But in common silk goods this only happens with the warp. The moistening, finishing, etc., of these goods occasions a difference between the threads of the warp and of the weft. This explains the distortion of such goods, and their tendency to break in the folds.—*Moniteur de la Teinture.*

A TASTEFUL FLOWER TRELLIS.

The annexed engraving represents a tasteful form of trellis which may be used in gardens, or which, with ivy trailed over it, would form a pretty ornament indoors. It consists simply of a framework of pivoted strips, arranged in the nature of lazy tongs, and pivoted to one or more supporting stakes. It swings on a pivot point, D, and is fastened at another point by a detachable pin, D′. This allows the folding up of the framework on the stake into smaller space, for more convenient shipment, and the ready opening and adjustment when desired for use.



HOERDE'S SEMOLINA SEPARATOR.

The frame may be spread to varying width and hight on the supporting stake by providing a number of holes, into which the fastening pin may be placed.

This device was patented through the Scientific American Patent Agency, October 24, 1876, by Mr. Charles H. Westcott, of Seneca Falls, N. Y.

Underground Photography.

At the Bradford Colliery, England, recently, accurate pictures of some underground workings in the mine were obtained by the oxyhydrogen light in combination with magnesium ribbon in combustion. The process occupied for each picture from twenty-five minutes to half an hour while the sensitive plate was under the action of light. The possibility of introducing a powerful and steady light completely under control, which may be fed from the surface by means of flexible tubing, and which admits of an illumination rivaling that of day to be sent into dangerous places from a convenient and safe distance, appears to open a pathway to very important practical applications. In any aspect, the demonstration that perfect lens pictures can be obtained, altogether independent of the sun, deserves attention.

Belladonna as a Cerebral Stimulant.

Dr. Theodore H. Jewett, in a paper before the Maine Medical Association, maintains that belladonna is not a simple narcotic only, as has been generally supposed, but a brain stimulant and tonic of the first order. It is the special and appropriate remedy for congestion and inflammation of the brain, or for the debility of which they are the results. It is also the remedy for many affections, congestions, inflammations, and perverted action of many organs whose integrity is dependent upon a normal condition of the brain.

Novel Mode of Strengthening Cast Iron.

The President, Mr. R. M. Bancroft, and members of the Civil and Mechanical Engineers' Society, when visiting Kirkaldy's testing and experimental works the other day, were shown a cast iron bar which had been sent to him to test, as a sample that had been treated with mysterious chemical mixtures, which were said to increase its tensile strength over fifty per cent. But as Mr. Kirkaldy's rule is always to break the specimen, or else his machine, he found it contained, upon being fractured, a center core of wrought iron about two inches in diameter, and six small ones of the same metal spaced around it. He thus exposed the secret. *Mining and Scientific Press.*

Bastie Glass.

Mrs. Nassau Senior writes to the London *Times* on the curious behaviour of tempered glass. She furnished twelve gas burners with tempered glass globes purchased in London, and having the veritable label of M. de la Bastie affixed to each. On the night of October 6, after the gas had been extinguished for exactly an hour, one of the globes burst with a report and fell in pieces on the floor, leaving the bottom ring still on the burner. These pieces, which were, of course, perfectly cold, were some two or three inches long, and an inch or so wide. They continued for an hour or more splitting up and sub-dividing themselves into smaller and still smaller fragments, each split being accompanied by a slight report, until at length there was not a fragment larger than a hazel nut, and the greater part of the glass was in pieces of about the size of a pea, and of a crystalline form. In the morning it was found that the rim had fallen from the burner to the floor in atoms.

Carbolic Acid Inhalations.

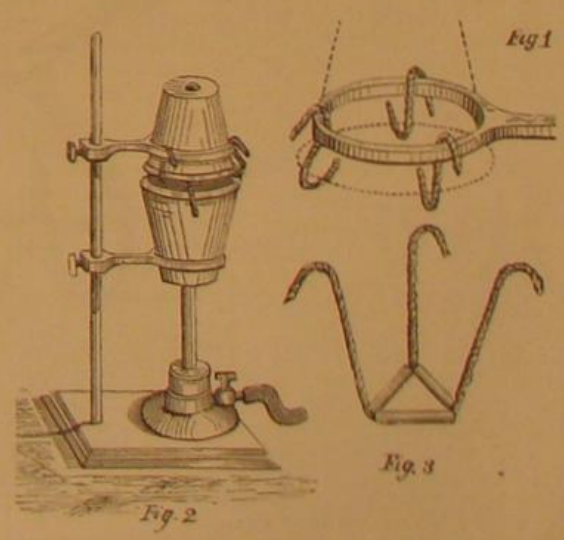
In a recent monograph of Dr. Lee, of the Hospital for Sick Children, London, the author states he has found marked benefit from the daily use of carbolic acid inhalations in whooping cough. The carbolic vapor ought to be diffused through the atmosphere of the room, in a certain proportion, and the patient must be confined to this atmosphere for several hours daily. Dr. Lee has had a vaporizing apparatus constructed on purpose, and he has exposed his patients (out-patients for the most part) to the vapor, in a little room adjoining his consulting room, for an hour or so once or twice a week. "Even under this limited use, there was undoubtedly an amelioration of the severe spasmodic cough."

SIMPLE LABORATORY APPARATUS.

The following short description of an extremely effective, cheap, and cleanly substitute for crucible jackets, etc., says Mr. E. T. Hardman in the *Chemical News*, may be useful, especially to those who have occasion to shift their quarters often.

The ordinary crucible jacket is made of sheet iron, and the small concentration of heat which it affords may be regarded as nearly *nil*, since radiation takes place very freely. Another drawback is that it soon becomes rusty or coated with scale. It is not only dirty to handle, therefore, but also presents the inconvenience of dropping some of its scale into the crucible if not carefully manipulated. Now an ordinary earthenware flower pot answers the purpose in every respect. It is of the proper shape, and being made of a non-conducting material it in a great measure prevents loss of heat from the burner. It is extremely cleanly to use, and it can be procured at the small cost of one cent or so. The bottom of the flower pot has a circular hole. This serves for the introduction of the Bunsen burner. As the supply of air would be insufficient otherwise, it will be necessary to enlarge the opening with a knife. The flower pot may be supported in the ring of a retort stand in the usual way. The chimney is a second flower pot inverted. To support it, the handiest way will be to make three S hooks of stout wire, and, having passed the narrow end of the pot upward through the ring, fix the rim within the hooks caught on the ring, as in Fig. 1.

It will be found convenient to devote a small retort stand permanently to the purpose. The whole arrangement is shown in Fig. 2, and is very handy, as the upper part can be raised to any desired hight, regulating the heat and draft, and can be shifted from side to side.



The apparatus acts admirably as a small gas furnace for crucible operations, such as the fusion of silicates with carbonates of soda—as in the analyses of rocks.

The support for the crucible may be either a triangle of wire covered with pipe shank, the end of the wire being bent upwards and formed into hooks so as to hang on the edge of the flower pot, Fig. 3, or three pipe-covered wires suspended in the position of the ribs of a crucible jacket. The former is necessary for small crucibles.

The flower pot also makes an excellent lamp screen, for steadying and concentrating the flame under evaporating basins, etc.; of course a sufficient interval must be kept between the pot and the basin, or the light will go out.

NEW COMBINATION HAND AND POWER FEED SURFACE PLANING MACHINE.

The accompanying engravings represent some new and attractive features in a machine intended for surfacing and smoothing, and for many of the operations usually performed upon a hand planing machine. It is one of a new series of machines recently brought out by the extensive wood tool builders J. A. Fay & Co., Cincinnati, Ohio, whose fine exhibit at the Centennial Exposition we recently illustrated. It combines facilities of adjustment for the processes of planing over the cylinder (Fig. 1) as in the ordinary hand planing machine, and for surfacing under the cylinder (Fig. 2) as in the power feed surfacing machine. Provision is also made for the easy removal of such parts as it may be necessary to displace to enable the operator to perform any especial work.

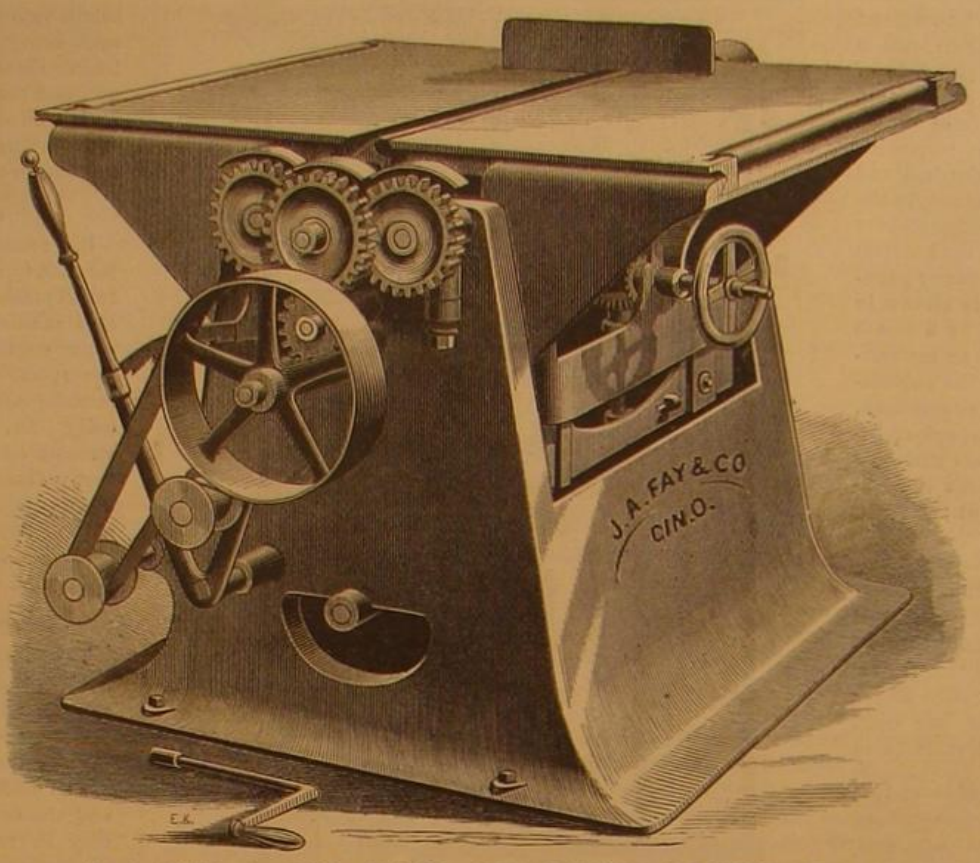
The frame of the machine is heavy, being made of continuous cast iron plate sides and ends. The tables forming the bed have horizontal and vertical adjustments, allowing them to be separated to let the cutter head pass between them as they are being raised or lowered. By means of the horizontal adjustment, the opening for the cutters is regulated, and by the vertical adjustment the thickness of cut is gaged, these adjustments governing the hand planing operations.

For surfacing, the tables are lowered until they are on a plane with the central portion of the bed. A continuous solid bed is thus formed, adjustable, for the different thicknesses of surfacing, by being raised and lowered by two screws, operated by a hand wheel and bevel gearing. The cylinder is stationary, being fixed in boxes cast solid to the sides, has steel journals, and is lipped with steel. It has three knives set on an angle to produce a drawing cut, reducing the tendency to split out in cross-grained lumber.

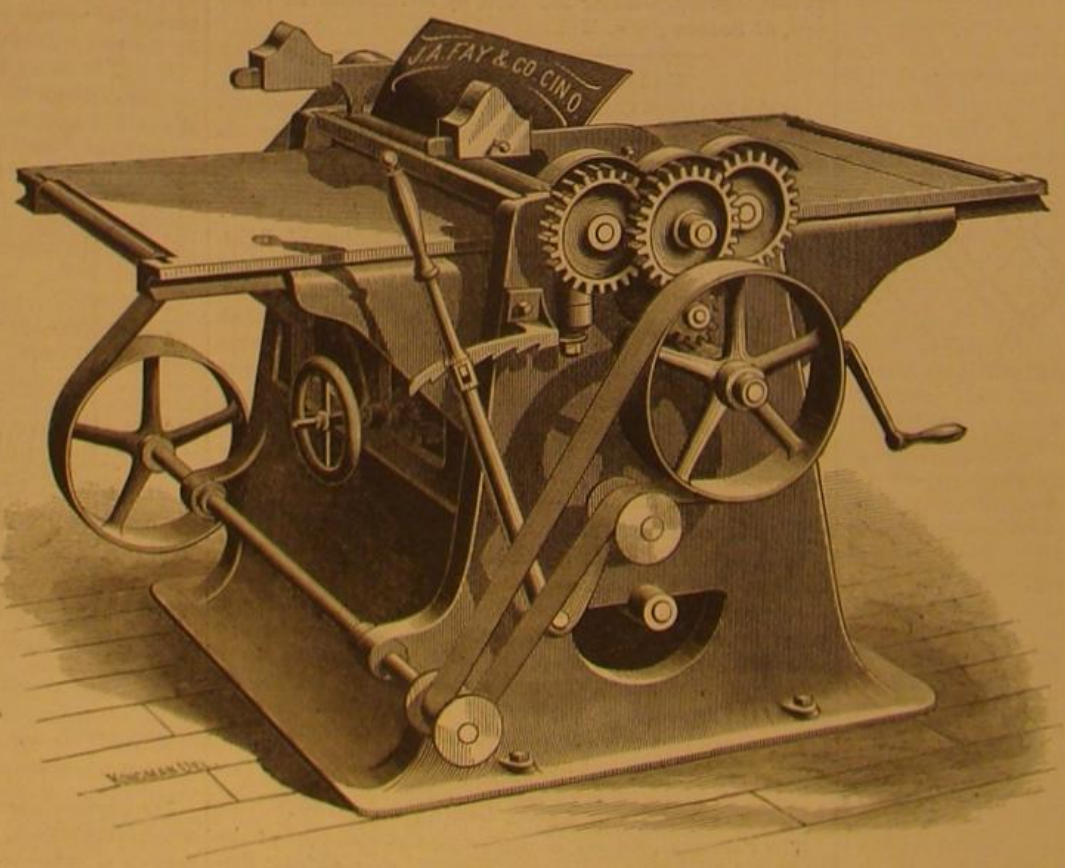
The feeding rolls are also set in bearings in the sides, the pressure being produced by volute steel springs and graduated by screws to such pressure as desired. The pressure bar, with the bonnet, is arranged to swing from the cutting edge of the cylinder and can be removed from the machine by detaching one bolt. When the bonnet is removed, the machine is ready to have the tables elevated, and thus a hand planing machine is obtained, suitable for the purpose of truing up, squaring, jointing, beveling, chamfering, and many other operations common to furniture, car, sash, and door manufactories, etc.

The surfacing or thicknessing is accomplished by the driven feeding rollers, operated by gearing, with such difference in the speed of the feed as the character of the work may demand. The feed is started or stopped by a belt tightener moved by a lever, and is under perfect and ready control of the operator. As will be seen by the engravings, the hand wheels and levers are convenient to the operator, and can be easily and quickly adjusted.

The capacity of the machine is for 24 inch surfacing, and up to 6 inches in thickness, and hand planing to 24 inches in width in addition to the other hand operations mentioned above. The apparatus as a whole is well adapted for rapid and accurate work, producing a smooth surface on all kinds of hard and soft wood. An application for patent is now pending. For further particulars, address J. A. Fay & Co., Cincinnati, Ohio.



J. A. FAY & CO.'S HAND AND POWER PLANER—Fig. 1.



J. A. FAY & CO.'S HAND AND POWER PLANER—Fig. 2.

Nature of Electricity.

A new hypothesis as to the nature of electricity (we learn from *Stummer's Ingenieur*) has been offered by Professor Rénard, of Nancy. He considers an electric current to be produced by longitudinal motion of the ether particles, which, at the same time, have a general forward motion. When the molecules of a body are surrounded by a greater ether atmosphere than the normal, the body is in the condition which we call positively electric; when the ether atmosphere about each molecule is less than the normal, the body is negatively electric. He has sought to explain various electrical phenomena thus: for example, the magnetization of steel needles by electrical discharges; regarding which, Savary has shown that, according to the position of the needle, it acts in one direction or the other.

The Largest Sail in the World.

A monster sail, said to be the largest in the world, may now be seen at Verdon's sail manufactory, Dublin. It measures in a rectangular form 180 feet by 60, and a cotemporary says of it: "The courses of a line of battle ship—the tapered ninety feet jib—the great awnings of the Crystal Palace, are simply pocket handkerchiefs when contrasted with this doubly stitched, powerfully roped sheet of canvas." This sail has been produced to aid, by a new method, the raising of sunken vessels.

Electrical Rubber.

A curious phenomenon has been described to the Belgian Academy by M. Spring. A sheet of thin vulcanized rubber, stretched to about six times its normal size, is rubbed with a cloth until it will attract light bodies. If, now, it be allowed to contract, the electrical attraction will diminish as the sheet becomes smaller, until it entirely disappears when the rubber has resumed its ordinary size. That the electric state is dependent to a certain extent on the molecular arrangement of the rubber (or sulphur) would appear to be evident; but the phenomenon deserves the attention of physicists.

Crystalloid on Colloid.

Dr. Guthrie lately described some experiments he had made to determine the effect of a crystalloid on a colloid, when in the presence of water. Two or three lumps of rock salt having been added to a jelly of size, and the whole hermetically sealed in a glass tube, the colloid parted with its water readily, a saturated solution of the salt was obtained, and the size became perfectly white and opaque, having undergone a structural change.

Dyeing Saffranin Rose on Silk.—The silk is prepared as for white, and, if it has a yellowish cast, stoved, rinsed, and washed twice in boiling soap lye. A fresh water at 122° Fah. is made up with the needful quantity of saffranin, and scoured with a fresh solution of tartaric acid.

Hollow Concrete Blocks for Building.

A hollow concrete block for general building purposes has been introduced by Mr. James Woodhouse, of Lambeth. It resembles a block of stone molded in such a form that a vertical and horizontal groove or cavity is retained, so that really it possesses the advantages of a hollow brick. One of the single blocks is 2 feet long, 1 foot wide, and 9 inches high, in the center of which are apertures formed by grooving the block all round and perforating the center; but the material can be worked up into blocks of any size. Quoin blocks are also made for working at the angles of buildings, and ornamental courses can be molded for cornices or string courses. When the blocks are put together, the apertures, both vertical and horizontal, are continuous, allowing a free circulation of air throughout the entire wall, ensuring ventilation and dryness. The blocks are proposed to be connected by cemented joggle holes or joints, by which they are joined together with great precision. The blocks can be moved and fixed by the lewis, and can be laid by the ordinary bricklayer. A bricklayer can lay about four hundred bricks per day, equal to 25 cubic feet; and, as the wages of the bricklayer and laborer are $2.50 gold, in England, per day, the cost of brickwork for labor is about 9½ cents per cubic foot. It is stated that any bricklayer can lay 50 of these concrete blocks a day, equal to 75 cubic feet, thus showing a saving of over 200 per cent in labor. The advantages claimed are: Greater strength, damp-resisting qualities, resistance to fire, expedition in use, vermin expulsion, general applicability, sanitary qualities, cheapness, appearance, facilities of manufacture, etc. The author alludes to these advantages in order. Speaking of the strength of concrete, the author says concrete walls have withstood the most violent equinoctial hurricanes. The absorbency of brick and stone is well known. A common brick absorbs about a pint of water, and a small house of one-brick walls, containing 12,000 bricks, is capable of holding 1,500 gallons, or 6½ tuns of water. Absorbent bricks also retain dirt and gases, but the concrete block insures dryness in walls, so essential to health; it is, in fact, nearly non absorbent. Of the fireproof qualities of the concrete block, being composed of burnt clay, scoriæ, clinkers, shingle, etc., it is hardly necessary to dwell, as our readers know the refractory nature of these component materials. In gravel concrete, great heat would disintegrate the mass, and cause fractures; but with the burnt ballast, slags, etc., used in the patent block, the most intense heat would be powerless to destroy the mass.

Another advantage in favor of this block construction, from a sanitary point of view, is the absence of mortar joints, through which vermin and germs of animal life can pass. The author also considers the advantages of concrete block walls from another point of view. By molded forms cheaper ornamentation can be obtained, and it is thought this will conduce to the adornment of our humble dwellings. The cost of this kind of walling in gold is stated comparatively as follows: 1 foot cubic plain faced masonry, built complete, 66 cents; 1 foot plain-faced brickwork, 24 cents; 1 foot plain-faced patent block, 18 cents; 1 foot molded masonry, $1 08; 1 foot molded brickwork, 30 cents; 1 foot molded pateut block, 24 cents.

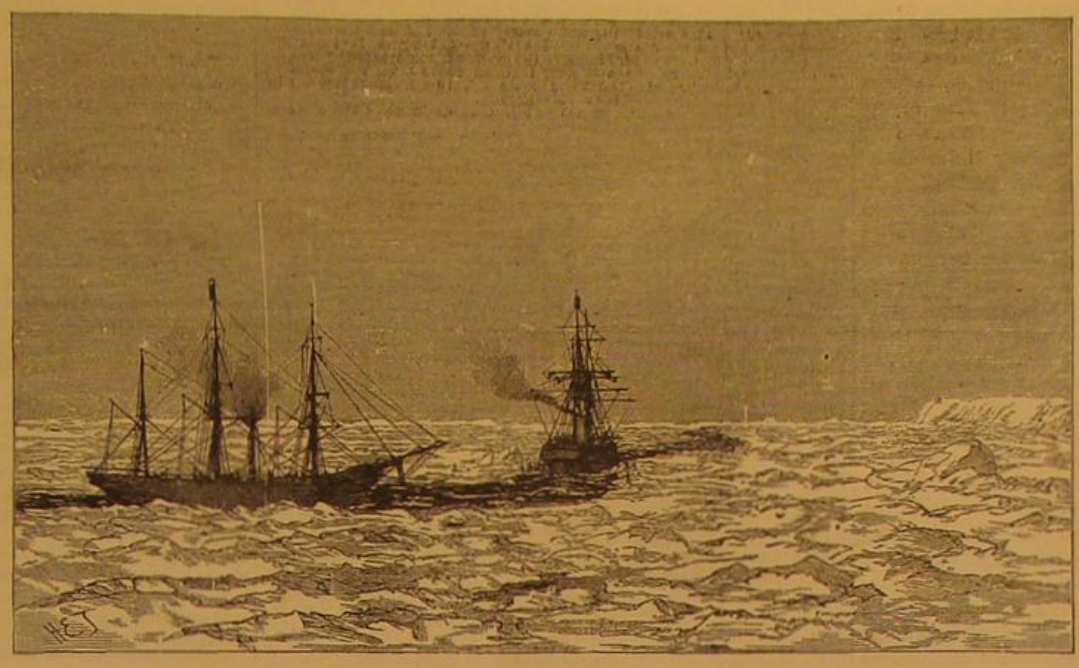
The author, in conclusion, believes the old-fashioned brick wall must give glace to this kind of walling. At all events, one great inducement is facility of manufacture. The ingredients—pounded shingle, burnt clay, slag, etc., can be procured on any site, as most lands have gravel or clay, all that is required being the mold. We have long advocated concrete blocks for wall building; several kinds of blocks have been introduced at different times, and we believe Mr. Woodhouse's patent hollow concrete block is a simple and effectual mode of obtaining the combined advantages of concrete—durability, lightness of walling, and damp-proof qualities. Mr. James Lemon, C. E., the borough surveyor of Southampton, and some other authorities, speak highly of the invention.—*Building News.*

No Connection with the Scientific American.—We learn that certain parties in Chicago have set up a soliciting business under the title of Munn & Co.

We beg to inform our patrons that the Chicago concern has no connection with the Scientific American or the publishers of this paper

THE BRITISH ARCTIC EXPEDITION.

We have already published a detailed account of the British Polar Expedition, which lately returned after severe but fruitless endeavors to reach the North Pole. We now present two interesting engravings, the one showing the Discovery steaming through the ice, with her consort, the Alert, following in her wake, and the other representing one of the tents of the sledge exploring parties, together with the sledges and dogs, the latter being secured as shown during the stay of their masters in camp.



THE ALERT AND THE DISCOVERY IN THE ICE.

The two ships, in making their way through the ice, assisted each other in the necessary manœuvring or forcing a passage through the heavy floes. The Discovery was placed ahead because her bows were the sharpest. Describing the process of breaking through the floes, Captain Nares says: "It will be difficult ever to efface from my mind the determined manner in which (when the Alert had become embedded in the ice, which, by her impetus against it, had accumulated round and sunk under her bows, and a great quantity, by floating to the surface again on her wake, had helplessly enclosed her abaft) the Discovery was handled in her advancing to our rescue. Having backed some distance astern, for the double purpose of allowing the *débris* ice from a former blow to float away, and for the vessel to attain a distance sufficient for the accumulation of momentum with which to strike a second blow, coming ahead at her utmost speed she would force her way into the ice, burying her bows in it as far aft as the foremast: the commanding officer on the bowsprit, carefully conning the ship to an inch, for had the ice not been struck fairly it would have caused her to carom off it against ourselves, with much havoc to the two. From the moment of the first impact the overhanging stem necessarily caused the ship's bow to rise three or four feet as she advanced from twelve to twenty feet into the solid floe, and imbedded herself, before the force of the blow was expended; and as the ship's way was stopped, the overhanging weight, by settling down, crushed the ice down still further ahead. Frequently, on these occasions, her jibboom was within touching distance of the Alert's boats! But, after a little experience had been gained, such confidence had we in each other that there was not the slightest swerving in any one instance."

Elasticity of Ice.

Professor Bianconi, of Bologna, Italy, has recently made a series of experiments with regard to the compressibility and plasticity of ice. Granite pebbles, placed on an ice surface, were pressed with constant and measured pressure for six, eight, or ten hours, at a surrounding temperature of 34° to 37° Fah. The impression was deep, but it was surrounded by a raised brim, and this again by a slight external cavity. M. Bianconi considers the central cavity to be the effect partly of strong compression, partly of fusion, produced by the heat proper of the pebble. The external cavity was probably due to initial calorific irradiation of the pebble; for, if the pebble had previously been placed in ice, this cavity became very small, or almost *nil*. The raised brim is the swelling of the ice, produced by the pressure, the ice being expelled in virtue of its plasticity. This appears very clearly when, the pressure of the pebble coming obliquely on a point of the ice surface, a certain protuberance is seen at an opposite point. Among other experiments, an iron plate, with a square hole in it, was strongly pressed on a plane surface of ice. After eight hours the ice had risen an inch or so through the hole, in the form of an unequal crest, and turned over on the plate, while the ice at the outer edges of the plate had similarly risen and turned over. Again, a bar of iron—plane below and convex above—was pressed for ten hours on a plane ice surface. The ice expelled below rose up on the sides, and became applied to the sloping surfaces. The experiments prove that ice has a manifest compressibility or plasticity, though slow and very limited.

Crystalized Iron.

The well known phenomenon that iron, with long use in which it is subject to strains of the nature of shocks, assumes a coarsely granular structure has recently been illustrated by experiments made at the Friedens Hoffnung coal pit, near Waldenburg, on the hanging chain of the miner's cage, two years in use. A link of this chain broke, with the first blow of an 11 lbs. hand hammer, into four pieces, whose surfaces of fracture showed a crystaline texture. Another link of the same chain, after having been annealed at a red heat, only broke after 23 blows with the same hammer, and in such a way that the fracture on the one side of the ring went quite through, and on the other side only half through, and presented a fibrous structure. These facts indicate the importance, in the arrangements for the lowering and raising of miners, of very careful observation of those changes of structure. They also appear to make desirable the introduction of spring boxes between the rope and the cage (so as to modify shocks), and the annealing, from time to time, of the connecting parts between the rope and the cage.

Nitroglycerin.

The following method has been recommended by M. Böttger (in the Frankfort Physical Society), for preparing nitroglycerin in small quantities, with a view to lecture experiments. It is stated to be quite free from danger. A few grammes of perfectly pure glycerin, free of water, is put into a test tube surrounded by a freezing mixture, and containing a mixture of 1 volume of the most concentrated nitric acid (1·52 specific gravity), and 2 volumes of the strongest sulphuric acid (1·83 specific gravity). Then, as quickly as possible, the whole is poured into a larger quantity of cold water. One now sees the nitroglycerin, that has formed like oil drops, sink to the bottom, being specifically the heavier liquid. You then soften it several times by decantation with fresh water, and, lastly, with a weak soda solution; remove the water with a few pieces of fused chloride of calcium, and you have then the nitroglycerin in such purity that it may, without danger, be kept any length of time, for lecture experiments.

ARCTIC SLEDGE-TRAVELING—THE ENCAMPMENT.

ONE of the most attractive features of the Exposition of 1878 will be a large aquarium capable of containing four hundred thousand gallons of water, affording tank room for four million pounds of fish. The estimated cost is about two hundred thousand dollars. We shall shortly publish an engraving of the aquarium.

Lace Making in England.

Honiton lace is, without doubt, the best ever made in England. Enormous prices were paid by the Honiton lace makers for Flemish thread, rising, it is said, to $500 gold the lb. during the war with France. The workwomen were also well paid, their wages being calculated in this wise: the lace ground was spread out on the counter, and the worker herself desired to cover it with shillings; and as many coins as found place on her work she carried away as the fruit of her labor. Real Honiton ground went out of date with the invention of bobbin net, on which the sprigs were applied, until that form of lace went out of date altogether, being superseded by the modern guipure—the Honiton of to-day—which composed the bridal dresses of the Crown Princess of Prussia, the Princess Louis of Hesse, and the Princess of Wales.

A great deal of trouble has been experienced in persuading the lace workers of Devonshire to adopt newer and better designs. For a long while they insisted on sticking to their old patterns, but at last some impression has been made on them by the authorities of South Kensington, who have recently supplied them with a large number of beautiful designs.

One effect, of the gradual degradation of taste which led to the fineness of the *réseau* being ultimately considered of more importance than the beauty of the pattern, was one of those determinations of the human intellect in one direction, which rarely fail to achieve success in the end. After innumerable failures, bobbin net was at last made by Heathcote's machine, and the value of the clear ground was gone for ever. Bobbin net machines were not only set up in England, but in Brussels, for the purpose of making the double and triple twisted net upon which the pillow flowers are sewn, to produce the so-called *point appliqué*. This extra fine Brussels net has become deservedly celebrated, and it consumes a very large quantity of cotton thread annually. Soon after the triumph of England with bobbin net, the Jacquard system was tried at Lyons for making lace by machinery, and no sooner were the experiments successful than Nottingham began the manufacture of machine lace on a large scale. At the International Exhibition of 1862, Nottingham exhibited Spanish laces, most faithful copies of the costly pillow-made Barcelona, imitations of Mechlin (the *brode* and *picot* executed by hand) and Brussels needle-point, Caen blondes and Valenciennes, rivaling those of Calais, also the black laces of Chantilly and Mirecourt. Machine lace has had a curious effect. It has almost exterminated the inferior kinds of handmade lace, but it has not diminished the demand for the finer fabrics of the pillow and the needle. On the contrary, the finest work of Alençon and Brussels has been sought more eagerly than ever by the rich, since machinery has brought the wearing of lace within the reach of all classes.—*Textile Manufacturer.*

Horticultural Hints.

The *Gardener's Monthly*, among other seasonable hints for horticulturists, points out that it is not so much severe frost that hurts vegetation as it is the severe thawings following the freezings. Everything, therefore, no matter how hardy, will be benefited by having something thrown over it. Hardy herbaceous plants can be protected by a little earth, and the same, if sandy, is good for seed beds.

An occasional change of soil is highly beneficial to flowers in pots. There is nothing better than surface soil from an old pasture, taken off about two inches deep, and thrown into a heap with about one sixth part old hot bed dung to partially decay. In addition to this staple item, smaller quantities of different matters should be gathered together for peculiar cases or particular plants. Peat, for instance, will be found very useful for many kinds of plants. This is not, as is often supposed, mere black sand, but a spongy, fibrous substance from the surface of bogs and boggy wastes. Sand should be collected sharp and clean; the washings from turnpike ditches are as good as anything. Leaf mold is best got already well decayed from the woods. That one makes for himself from rotten leaves is seldom good for anything; it is always sour, and seems indigestible to vegetation. A load or so of well decayed cow manure is a good thing for the gardener to have by him, as those plants that want cool soil prefer it to any other manure.

The Extinct Animals of North America.

At a recent meeting of the Leeds Philosophical and Literary Society, an interesting lecture on this subject was delivered by Professor W. H. Flower, F.R.S., who was introduced by the President (Rev. J. H. McCheane). The lecturer described some discoveries lately made in certain districts of North America, which threw a great deal of new light upon past living inhabitants of this world. When naturalists attempted to reconstruct a history of extinct animals, they had to gather evidence from fossils in rocks or stones, and from deeply buried remains of the harder and more imperishable parts of these animals, such as their bones, teeth, shells, etc. Most wonderful deposits of this kind had lately been found in the western part of North America, especially between the river Mississippi and the Pacific—a wide region, which had only of late been opened up for scientific exploration. Although only three or four scientific men had yet been laboring there, they had already discovered during the last five or six years almost as many strange kinds of fossil animals as all those put together which had previously been found in every other part of the world. The discoveries thus made included some which dated so far back as the eocene epoch of the tertiary period. At one place the deposits were found fully a mile in depth, upon what must have been in some remote age the bottom of a great fresh water lake. Common as we thought the horse, donkey, or zebra, this species was remarkably specialized—unlike all other animals now existing, and wonderfully adapted for its own particular functions. Amongst these North American remains, there were found traces of an animal which had in the course of ages apparently developed into the horse of our own day. The earliest remains seem to represent an animal not much larger than a fox, and possessing the principal anatomical characteristics of the horse, but with some differences in teeth and hoofs. The later remains of succeeding epochs appeared to show the same animal becoming larger, first growing to the size of a sheep, and then as large as a donkey, whilst at the same time the minor distinctions which differentiated it from the horse of our own period gradually disappeared. The same explorations had shown that once upon a time there were in North America many curious kinds of rhinoceros, as well as in the southern parts of Africa and Asia, where alone these animals are now found.

There had also been found there the remains of some creatures, apparently intermediate in their character between the sheep and the pig—different as these two classes now appeared to us. The elephant was an extremely specialized animal, which seemed to have no relations now amongst existing creatures. These investigations into past life disclosed, however, that the elephant was not so isolated as we supposed, in illustration of which Professor Flower described the singular resemblances discovered in the now extinct *uintatherium*. Generally, there was scarcely any group of animals now existing of which some representatives had not been found in these North American excavations, whilst there were likewise found many which we could not classify with any existing order. Of all birds at present existing, none were known to have teeth; but there had now been found, amongst the remains in the chalk formation, distinct traces of two or three kinds of large water birds which had long rows of true teeth. There had also been found, in the same productive field, an enormous and interesting fossil vegetation, opening up to the botanist as well as the naturalist something like a new world of past life.

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DECISIONS OF THE COURTS.

Supreme Court of the United States.

FREDERICK BIRDSALL AND GEORGE F. LANGTRY, PLAINTIFFS IN ERROR, *vs.* C. C. COOLIDGE.

In error to the Circuit Court of the United States for the District of Nevada.—Decided October term, 1876.]

In an action at law for the infringement of a patent, the jury is required to find the actual damages sustained by the plaintiff. The court has power in such case to enter judgment for any sum above the amount of the verdict, not exceeding three times the amount of the same, together with costs.

Damages are given as a compensation, recompense, or satisfaction to the plaintiff for any injury actually received by him from the defendant.

Compensatory damages and actual damages mean the same thing.

Prior to the act of July 8, 1870, a patentee might proceed against an infringer either in equity or at law.

In equity the infringer would be regarded as trustee of the owner of the patent as respects the gains and profits which he had made by the unlawful use of the invention.

At law he could recover actual damages, the measure thereof being not what he defendants had gained, but what the plaintiff had lost.

The remedy at law remains unchanged, but in equity, where the gains and profits are clearly not sufficient to compensate the complainant for the injury sustained by the infringement, damages of a compensatory character may also be allowed.

Evidence of an established royalty will furnish the true measure of damages in an action at law, where the unlawful acts consist in making and selling the patented improvement, or in the extensive and protracted use of the same, without palliation or excuse; but when the use is a limited one, and for a brief period, it is error to apply that rule arbitrarily and without any qualification.

United States Circuit Court--Northern District of Ohio.

HENRY F. MANN *vs.* EDWIN BAYLISS.—HARVESTER PATENT.

[In Chancery.—Before Emmons, C. J.—April term, 1876.]

[An incomplete report of this case was published in the *Official Gazette*, July 25, 1876, p. 113. The following is a more extended report, as published in the Chicago *Legal Times*, October 7, 1876.]

In this complainant's bill recites that he is owner of letters patent of the United States, dated February 28, 1871, being a reissue and extension of letters patent No. 15,044, dated June 3, 1856, said reissued letters patent being numbered 4,281, for an improvement in harvesters, complainant having been one of the original patentees, and having acquired the interest of his co-patentee, Jacob J. Mann, by an assignment from said Jacob's administrator.

The improvement consists, in brief terms, in having an elevated side delivery of the cut grain in the straw, by means of an endless apron, whereby the grain is discharged into a stationary receiver, of concave form, from whence, by means of a revolving rake, the teeth of which describe a circle nearly coincident with the circle of which the concave receiver form a segment, the grain is gathered into gavels of suitable size for binding into sheaves or bundles, and discharged upon the ground. The bill prays answer, account of profits and damages, and injunction in the usual form.

The answer denies originality and novelty of the invention, as also infringement, in that, whereas by complainant's device the grain is discharged into a receiver which is concave in form, the machines constructed by defendant discharge their grain by a slightly inclined chute from the elevating apron on to a receiver which is flat and horizontal, from which it is taken by the binder without the use of the revolving rake.

On the hearing, the question turned mainly upon the fourth claim of complainant's patent, which is in these words:

4. The stationary concave receiver, I, having a continuous surface, arranged as described at the side of a harvesting machine, having an elevated side delivery so as to receive the cut grain from the elevating and delivery apparatus, and collect the same into gavels preparatory to their being discharged from the machine."

His Honor expressed a strong sympathy with those canons of construction which so interpret a claim as to protect what a meritorious invention had created. He was just as much entitled to his right of property as a farmer to his wheat, or to the fat which he put upon his animals. If the invention be trivial, and no important change be wrought in the department of labor into which the device was introduced, a less liberal construction of claims should be indulged in, and a less liberal application of the doctrine of mechanical equivalents should be extended.

The fourth claim is alone in controversy here, and its interpretation the only question necessarily to be decided. The answer insists that when properly interpreted the defendant does not infringe, and that if constructed so as to include defendant's device, it is antedated by similar receivers before existing.

"We hold the fourth claim to include the conditions in which this curved metallic receiver could alone be used in the originally patented device. To construe it otherwise, and make it include, as plaintiff's counsel contend, every kind of barrier between the apparatus of an elevated delivery and the binding table upon a harvesting machine, save a perpendicular one, would, upon principles too familiar to be argued at length, render it void. Substantially, it would include all modes, which, in the patent law, is impossible. No man of ordinary intelligence, desiring to annex a table to a harvester, would fail to insert some obstruction between the one and the other, to prevent the grain being carried by the wind into the moving machinery. It would be an equal lack of intelligence to make it perpendicular; and this patent of Mann's was by no means necessary to instruct him to make it oblique, and carry it so far forward upon the tables as to bring the fallen grain within the reach of the binders. The defendants, in annexing their new and useful binding table to an old familiar device, have adopted the only possible mode of conducting the grain from one to the other. Learned counsel were repeatedly asked to conceive of any other. They were unable to state any. To construe this fourth claim so as to include what defendant has actually done would impute to the patent law the folly of granting to one citizen the right to divorce, during fourteen years, this useful addition from the machine it was intended to improve, and where their union required no device or contrivance which an ordinary citizen, without any mechanical knowledge whatever, would not readily adopt. This consequence is demonstrative that the Patent Office could not have intended it. It patented the receiver with the rake and accompanying conditions. We read this fourth claim so as to include them. Thus construed, the defendant's device is conceded not to infringe it.

"We place some confidence in the fact that, as often as learned counsel for the complainant were asked to state the leading features of this device and what distinguished it from what preceded it, they invariably pointed to the accompanying conditions which the court include in this fourth claim, and none of which are employed by this defendant."

[*George H. Christy* and *William Bakewell*, for complainant. *S. A. Goodwin*, for defendant.]

Recent American and Foreign Patents.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED COMBINED SASH LOCK AND HOLDER.

Sylvester J. Tucker and Massena E. Gary, Richmond, Va.—The object of this invention is to provide an improved form of combined sash lock and sash holder which shall automatically maintain the sash in any elevated position, holding the same at any desired hight without danger of falling, and which shall also be so arranged as to lock the sash when lowered, so as to prevent access to the building from the outside of the window. To this end the improvement consists in combining a rubber-faced cam-headed lever for supporting the sash by frictional contact, a spring for pressing the cam against the window frame, and a pivoted bar which, in one position, forms a bearing for the thumb or finger to rest upon while lifting the end of the cam-headed lever when raising the sash, or which may be thrown over on its pivot to engage with a notch in the window frame when the sash is down, to lock the same against all efforts to raise it from the outside.

IMPROVED WOOD GRINDER FOR PAPER PULP.

Joseph O. Gregg, Elkhart, Ind.—The wood to be reduced to pulp is placed in guide boxes. Weighted followers force the wood against a grindstone having a beveled and grooved periphery, and as the stone is revolved the fiber is separated, and washed away by a jet of water.

IMPROVED DESK.

Olaus Hansen, Cedar Vale, Kan.—This is a vertical desk, wardrobe, or other analogous article of household furniture, having the end recesses, corner posts, and folding doors connected with the latter by flat hinges, whereby the said doors are adapted to swing around the posts and lie concealed in the recesses behind them. The doors are thereby not in the way, occupy no space, and may be readily closed again after use.

IMPROVED STAIR BUILDERS' TOOL.

Theodore Simonson, Hillsborough, Ohio.—This invention relates to the class of tools used by stair builders in getting the pitch, bevels, and length of wreaths or twists in hand rails. It consists of two bars of wood hinged together, having at their free ends adjustable slotted pieces which are held in place by thumb screws. The instrument avoids the complication of geometric lines, usually resorted to, and accomplishes the desired result with two simple lines.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED BALE BAND STRETCHER.

Charles M Pearre, Galveston, Tex.—The object of the invention is to provide a convenient and easily handled bale band stretcher, to be used in baling cotton, hay, etc., for the purpose of taking out the slack of the band that cannot be taken out by hand while the bale is under the press. To this end the improvement consists in a bar carrying at its end a gripping device for one end of the band, and a guide socket, in combination with an elbow lever pivoted at its end to a slide bar moving through said guide socket and carrying also a gripping device for the other end of the band, which two gripping devices are adapted to be brought together by bringing the handles of the elbow lever and bar together, and tilting the elbow lever upon its angle, at which point it is attached to the bar by a keeper, and slides over an inclined portion of the same upon rollers.

IMPROVED BALE TIE.

Joseph C. DuBois, Tuscaloosa, Ala.—The invention relates to that class of bale ties which are made of hoop iron, and applied to to form a tie without bending either end. It consists of a band whose one end is slotted while the other is perforated, the two secured together by a wire. Its construction is such that the cost of manufacture is very trifling, while it possesses efficiency and durability.

IMPROVED ARGAND GAS BURNER.

Samuel B. H. Vance, New York city, assignor to Mitchell, Vance, & Co., of same place.—This is so constructed as to prevent the hissing noise of the gas, and to enable the flow of gas, and, consequently, the amount of light, to be regulated as desired. There is a new valve which may be adjusted to admit of the passage of any desired amount of gas.

IMPROVED REIN-SUPPORTING ATTACHMENT FOR NECK YOKES.

Charles R. Hicks, Mount Sterling, Ill.—This invention consists in attaching to the upper part of the neck yoke a supporting plate with raised center part, having screw holes with different inclination, into which an arm with pivoted end link and swiveled ring is secured, to secure the lines at their point of crossing. This prevents the lines from becoming entangled beneath the tongue.

IMPROVED CURRY COMB.

Giles H. Hawrican, North Hero, Vt.—This implement is formed of a straight blade, convexo-convex in cross section, and provided on one side with beveled teeth having their points adjusted in line. This construction adapts the comb to be used equally well upon those parts of the body of the horse or other animal which are sinuous or angular as upon those which are smooth or gently rounded.

IMPROVED RULER.

Charles M. Hayes, Silver City, Idaho Ter.—The invention relates to parallel rulers, and consists in making a slotlongitudinally—in the wood, metal, gutta percha or other material of which it may be made—in order to enable the user to sit at a table or desk, and without rising, stooping, or changing his position, to see the figures under which a balancing line is to be drawn, the same being thus readily accomplished without the least danger of a blot.

IMPROVED LAMP.

David Sanford, Ashton, Ill.—The burning apparatus here consists of an ordinary wick which passes through a long tube, and is tightly packed therein with cotton. At the summit is a piece of incombustible material, such as porous stone, which absorbs the oil drawn up by the wick, and so supports the flame. The advantages claimed for this arrangement are that, when a flame of the proper shape has been obtained, it will always remain the same; so that the flame can be arranged at such a distance above the oil reservoir that the oil cannot be heated; that burning vapor will now pass down to the oil; and that the light may be regulated as desired.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED JIGGER.

Anthony Rowse, Nesquehoning, Pa.—This invention consists in causing the scraper of an ore separator to move down into the jig as the latter moves up, and the reverse, so as completely to separate the ore at a single operation. When used for separating coal from slate, the slate, being the heaviest, passes through the bottom of the shaking screen, while the coal is scraped off into the pit; but in separating iron ore, the ore, being the heaviest, passes the screen, while the refuse matters are scraped off into the pit.

IMPROVED MACHINE FOR FINISHING BUTTONS.

Marcus M. Rhodes, Taunton, Mass., assignor to M. M. Rhodes & Son, of same place.—This includes a variety of novel machinery for finishing buttons, including a combination of a feeding and holding device with a revolving mandrel carrying a cutter or finisher. The whole is arranged so that buttons that are placed in bulk in a receptacle in the machine are automatically placed in a holding device to be operated on by the rotating cutter or finishing tool. The object is to rapidly finish the edges of buttons. The machine is more particularly adapted to finishing *papier maché* shoe buttons.

IMPROVED SEWING MACHINE SHUTTLE.

William Gillett, Madison, Wis.—This consists in a support for the bobbin, which also carries the tension and thread slide, that can be readily attached to or removed from the shuttle. The object is to provide a reliable support for the bobbin, and an even and smooth tension on the thread, while all the parts are retained firmly in their places.

IMPROVED PAPER-FEEDING MACHINE.

Socrates Schofield, Providence, R. I., and Charles E. Baker, Montclair, N. J., assignors to themselves and Charles E. Johnson, Philadelphia, Pa.—This consists in arranging a pin in a paper feeder, so that it will make a hole on the backward movement, preparatory to entering the same on the forward movement. The object is to cause the penetrating instrument more surely to penetrate the top sheet and not affect the sheet below.

NEW HOUSEHOLD INVENTIONS.

IMPROVED JELLY JAR.

Nicholas P. Todd, Shamong, N. J.—This jelly jar is designed to form the jelly directly into molded shape when filling the jars for sale, so that it may be taken out and served in neat and convenient manner, being specially adapted for hotel, restaurant, and family use. The jar has a number of interior compartments of suitable shape, and a rim that extends to a suitable hight above the compartments, for the purpose of containing a portion of jelly additional to that required to fill the compartments, and which will form the base of the molded jelly when the same is inverted. The jars may be made of larger size and arranged with suitable ornamentation in the molding compartments and on the top parts, so that the jelly presents, on being taken out, an elegant and attractive appearance.

NEW AGRICULTURAL INVENTIONS.

IMPROVED PLOW FENDER.

Andrew C. McLeary, Humboldt, Tenn., assignor of one half his right to James H. Hamon and Samuel McLeary, of same place.—This is an improved fender attachment, by which the plowing of young corn, cotton, etc., may be accomplished without stopping to uncover and take off clods from the young plants. The clods and irregular lumps of earth are carried back into the furrow. The fender piece is secured by curved rods and braces to the plow stock, and a swinging and adjustable harrow is applied to the fender piece.

IMPROVED SEED PLANTER.

Lycurgus J. Bosworth, Monmouth, Ill.—This machine has expansion spoke wheels, the spokes of which may be made to project more or less to cause the wheels to measure off more or less ground at each revolution, and plant the hills at a greater or less distance apart, as may be desired. The spoke wheels may also be turned to bring them into position to drop the seed in line with the hills previously planted.

IMPROVED SEED-DROPPING PLATE FOR GRAIN DRILLS.

Ephraim B. Null, Oxford, Ohio.—This consists in a seed-dropping plate, in which the holes are notched around their periphery, or are made star-shaped, to adapt them to receive large or small kernels. It is thus adapted to drop but one grain at a time, regardless of the size of the kernels.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Enquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical enquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present.

The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to enclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to enclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

R. J. will find a description of the physiological and pathological properties of alcohol on p. 91, vol. 31.—F. D. will find a recipe for blacking for patterns on p. 409, vol. 33.—F. N. T. will find a prescription for boils on p. 379, vol. 24.—B. J. will find on p. 337, vol. 33, directions for staining white wood in imitation of black walnut.—H. G. M., T. W., G. H. C., H. E. K., W. W. O., J. G. M., D. A. S., E. P. N., W. W. Y., C. E. G., and others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) T. S. asks: How can I separate gold and platinum filings? A. Dissolve the filings in strong aqua regia (3 parts hydrochloric acid to 1 of nitric acid), dilute with water, and filter. Evaporate the filtrate to dryness over a water bath, dissolve in hot water, rinse the evaporating dish with a little chlorine water or aqua regia (as small a quantity as possible) and add the rinsings to the main solution. Add to the solution chloride of ammonium until no further precipitate forms; allow to stand in a warm place for several hours, with occasional stirring. Remove the precipitate, which consists of the double chloride of platinum and ammonium, by filtration, and to the filtrate (the liquid) add a strong solution of protosulphate of iron; heat nearly to the boiling point, and allow to stand in a warm place for several hours, and filter. This last precipitate contains the gold; dry it on the filter paper, mix it with a little carbonate of soda (anhydrous) and a small fragment of rosin, place it in a small black lead crucible and heat strongly in a furnace or blacksmith's forge. If the amount of gold is small, it may be reduced on a piece of charcoal by means of a blowpipe and a good spirit lamp. If it is desired to reduce the platinum salt to the metallic form, it will be necessary to use the compound (oxyhydrogen) blowpipe and a small lime crucible: the substance should be mixed thoroughly with carbonate of soda, and the flame be made to impinge directly upon the substance, till it is fused to a clear button. The platinum salt may, however, be readily disposed of to any large dealer in fine chemicals or to manufacturers of platinum utensils.

(2) A. P. says: I notice that in several instances you recommend 70 per cent alcohol for making shellac varnish. Is it better than 95 per cent, and why? A. The chief recommendations are that it is much cheaper and does not evaporate quite as rapidly as stronger alcohol. The proportions of ingredients in the varnish depend altogether upon the character of the work upon which it is to be employed.

(3) J. C. K. asks: How is marking ink in cakes made? A. It consists essentially of boneblack, lampblack, gum arabic, molasses, and vinegar. The quantities of the two latter ingredients are quite small.

(4) F. B. H. asks: 1. How can I tan or treat bladders so that they will remain soft, pliant? A. We know of no such tanning process, and have not seen bladders treated so as to retain these properties.

Is there a machine by which a penman can produce one or more facsimile copies of a letter or instrument upon writing paper by the same operation that produces the original? A. The Edison electric writing pen allows any number of duplicates of a writing to be rapidly made. But this does not make the impression at the same time as the original. The manifold writer, consisting of alternate sheets of colored paper (see p. 378, vol. 28) and prepared tissue paper, the whole being written upon with a blunt point, comes the nearest to your description.

(5) A. G. S. asks: Is it a good plan to wash millstones with vinegar? A. If the millstones are of good material, the vinegar should not hurt them, and would help to wash off insoluble earthy matters. Other very dilute acids would probably answer equally well.

(6) W. asks: Has the lost art of coloring glass ever been rediscovered? Last June I resolved to make a preparation of paint to put on a tin roof. I used yellow ocher and oil mixed. I put on one coat. Not content with that, I went to work, put two other ingredients into a pot, heated them to boiling, put them into the paint pot, and gave the roof another coat of these four ingredients. It was very early in the morning, and the sun rose directly opposite the window, causing a very hot vapor to rise and settle on the second story window over the roof of the bay window. The rays of the sun were so powerful on these four panes of glass over the roof of the bay window that a perfect coloring of the glass took place. Any one, standing on the ground and looking up, can see 4 lights of glass over the said roof containing the most beautiful colors that eye ever beheld, arranged as complementaries, in more graceful style than any artist could do it The colors cannot be rubbed nor washed off, and The colors cannot be seen from the inside of the room, the glass being quite clear and transparent. A. The art of staining glass has never been lost. Some of the ancient pigments cannot now be made. When the color is given to glass by a thin coating of colored glass, it is said to be flashed glass. When the coloring matter is spread through the entire material, it is said to be ruby, or green, or canary glass, according as it is stained with the oxides of copper, or oxide of uranium, etc. There is no difficulty in doing it. The appearances you mention are known in optics as the "interference colors of thin films," and are produced by a transparent film on the glass.

(7) P. L. G. asks: How may a dentist determine the fineness of a gold plate brought to him for repair, so that he may know what fineness of solder to use? A. Try it upon a touchstone and compare the streak with the streak of gold of a known degree of fineness.

(8) W. S. asks: 1. What are the relative volumes of 1 cubic inch of bisulphide of carbon, and 1 inch of its vapor at a tension of 15 lbs. per square inch? What is the weight of 1 cubic inch of bisulphide of carbon? A. The density of bisulphide of carbon at 60° is 1·27; a cubic inch would therefore weigh 252·5×1·27=320·6 grains. The density of the vapor of bisulphide of carbon is 2·67; a cubic inch would therefore weigh 2·67×0·30935=0·826 grains. A cubic inch of bisulphide of carbon converted into vapor at 60° and 15 lbs. pressure would therefore occupy 388 cubic inches. 2. In what proportion must the vapor of a hydrocarbon, like benzine, be mixed with atmospheric air for perfect combustion? A. No general proportion can be given, the amount depending upon the relative proportion of the carbon and hydrogen in the compound. In the case of benzine, $C_6 H_6$, about 7½ times its volume, in the state of vapor, of oxygen will be required for complete combustion. 3. Can such a mixture be lighted by a platinum wire heated by an electric current, the same as carbureted hydrogen gas? A. Yes.

What paint or composition for iron will withstand great heat without burning or scaling off soon? It is intended for boiler fronts and furnace doors. A. There is none.

(9) W. H. W. asks: How can I make a mucilage such as is used on postage stamps? A. Use a strong aqueous solution of dextrin.

(10) D. W. S. asks: 1. Has iodoform ever been successfully used as a medicine? A. Iodoform was first employed as a remedy by Bouchardet of Paris in 1836. He recommended it as an alterative in scrofulous affections, etc. It soon fell into disuse. In 1848 it was again brought forward. At present it is not much employed as an internal remedy. 2. What is its effect on the human system? A. It has been recommended for use in scrofula, goitre, rickets, syphilis, consumption, and some diseases of the skin. Iodine is also used in the same conditions, and many believe that the good effects which have been obtained from the use of iodoform result from the iodine which it contains, and which is set free when it is decomposed in the human body. It is usually given in doses of ¾ to 1½ grains, in pill form. Iodoform is used as an external application to a considerable extent in cancer of the womb and breast, and as a dressing to certain forms of ulceration. Excellent effects are obtained from it when used in this way. It is applied either in powders, as an ointment, or in ethereal solution. Sometimes it is used as a suppository in the rectum or vagina. 3. Is it poisonous in any degree? A. When taken internally in moderate quantities, it does not usually produce any irritating effects. In overdoses it occasions intoxication, great nervous excitement, acceleration of the pulse, staggering gait, and convulsions resembling those produced by strychnin. The breath gives off the characteristic odor of iodoform. The quantity which will produce these effects and occasion death in the human being is not stated. In one experiment, upon a large dog, fifty grains proved fatal. One of the chief effects of iodoform is its anæsthetic power. This is very marked when it is used upon sores (not inflamed), and when applied to the mucous membrane. In the throat and nasal passages, the rectum and vagina, this is often very decided.

What is meant by standard copies of the ohm, in speaking of electrical measurements? A. For a description of the ohm, which is a measure of electrical resistance see p. 117, vol. 30.

(11) B. says: I have thousands of tuns of sea kelp, not available for agricultural purposes. Can one suggest a method of utilizing it? A. Sea weed (*fucus palmatus* and *saccharinus*) is chiefly employed as a source of iodine. The process for extracting the iodine is very long and tedious, and it requires considerable chemical skill to carry on the business successfully. There is no work of this kind in this country.

(12) E. S. T. says: I claim that, the larger the surface of a lightning rod is, the heavier is the charge it could conduct. A friend averred that it is the solid contents that must be considered and not the amount of surface presented. I find on reading your journal that I am wrong. Can you state what proof there is that shows that the surface area does not add to the conductibility? The facts on which I based my arguments I find in Silliman's "Philosophy," edition 1859, p. 923: "Electricity resides only on the outer surfaces," etc. A. The question of conductivity may be regarded in two lights, the results of which are very different. For instance, we know experimentally that a wide and very thin foil of metal is capable of transmitting the charge from a large plate electrical machine, giving a flash of perhaps several inches in length, while the same foil would be deflagrated by the current from one or two cells of battery. This apparent anomaly is not so difficult of explanation as might at first appear. In the former case, the electricity has what is called high potential or tension, and is deficient in quantity; in the latter, the quantity, on which the heating effects depend, is very great. Again all conductors take what is called a charge, the magnitude of which depends upon several circumstances, and a certain time is consumed in the charging. Now, as regards comparatively short conductors at least, little or no heating effect is produced until the latter becomes charged throughout, in other words, until the current becomes uniform in the different sections of the conductor. If, then, but a fractional part of the time required to charge a conductor is occupied in communicating electricity to it, the latter is not affected, notwithstanding the fact that it would be melted were a current of equal strength maintained through it for even a few seconds. We would conclude from the above, then, when the discharge is all but instantaneous, that conductors possessing considerable surface are most desirable; but when it is remembered that lightning flashes, besides combining great quantity with high potential, sometimes succeed each other so as to produce a veritable current, that, and a marginal allowance for safety, suggest the employment of rods so constructed as to unite, with large mass of metal, considerable development of surface. The item from Silliman's "Philosophy" refers to the static charge: that alone resides on the surface, whereas, on the other hand, the whole mass of the conductor is concerned in transmitting a current after the charge has been once effected.

(13) J. H. B. asks: What kind of paint is best for painting galvanized iron exposed to the weather? The zinc appears to oxidize between the paint and the iron, and then peels off, when lead or common paint is used. A. One of the best paints we know of for this purpose, where a dark color is not objectionable, is common asphalt dissolved in turpentine or benzine. It is extremely tenacious, dries soon, and becomes very hard and insoluble by the action of sunlight. It is flexible and very durable. Do not mistake it for coal tar.

(14) E. L. W. says: I have a solution of nitrate of silver precipitated with cyanide of potassium, also a gold solution done in the same way. What cheap chemical could I add to let the work, in coming from the bath, need no burnishing? The bath is: 1 oz. silver, cut in 8 ozs. nitric acid and 2 ozs. water; and I add that to 5 ozs cyanide of potassium in 32 ozs. water. A. There is nothing.

1. Is there a soft soldering fluid that will not rust? I now use muriate of zinc, with sal ammoniac added, but it rusts my tools. A. Try oleic acid (crude). 2. There is a solution sold named anti-oxidizer, which is clear as water, tastes similar to borax, and is used to preserve the color of gold and silver while being heated. The fluid is undoubtedly water and some chemical dissolved in it. I tried borax, but it does not seem to be that. It does not answer the purpose. Have you any idea what it is? A. It is probably chloride of ammonium (sal ammoniac).

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

N. F. R.—It is beautifully crystallized sulphide of iron in gneis rock. The outer shell is composed of sesquioxide of iron from the decomposition of the sulphide.—Two specimens in a needle box, with no name on it, have been received. No. 1 is chalcopyrite—sulphide of copper—and carbonate of copper. No. 2 is clay discolored by oxide of iron.—S. N.—No. 1 is a silicate containing iron, alumina, soda, lime, and magnesia. The nodular piece of stone is marcasite. No. 2 is sulphide of iron with clay. No. 3 is a piece of shale with crystals of carbonate of lime in the crevices. J. N. C.—It is a variety of infusorial earth. See p. 240, vol. 35.—G. W. S.—It is micaceous sand from decomposed and disintegrated graniteferous rock. It does not contain any precious metal. Other than the attraction of gravitation, which acts alike between all bodies, there exists no attractive influence whatever between the metals and peach tree limbs (or limbs of other trees). The divining rod is not a scientific instrument; and aside from its employment in sensational tales, its wonderful attributes, like those of the philosopher's stone, are merely delusive fancies.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Mississippi Jetties. By A. S.
On Binocular Vision. By J. H. H.
On Car Wheels on a Curve. By S. T.

Also inquiries and answers from the following:

F. O. H.—C. A. C.—J. A. McN.—J. L. R.—C. W. J.—A. J. B.—E. B.—H. B. S.—W. C. F.—E. G.—J. T. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells a tricycle propelled by steam? Whose is the best form of steam engine? Who sells electric telegraph wire? Whose are the best headlights for locomotives?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

Up to the hour of going to press, the list of patents issued during the week ending November 21, and bearing that date, had not arrived from Washington.

VALUE OF PATENTS,

AND

How to Obtain Them.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the THIRTY years they have acted as solicitors and publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*

This is the closing inquiry in nearly every letter, describing some invention, which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his right.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such a search, make out a written description of the invention, in your own words, and a pencil, or pen and ink sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent must furnish a model of his invention, if susceptible of one; or if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft or postal order, on New York, to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; Russia, 70,000,000. Patents may be secured by American citizens in all these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted, at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patents, which states the cost, time granted, and the requirements of each country. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

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In order to apply for a patent in Canada, the applicant must furnish a working model, showing the operation of the improved parts; the model need not exceed eighteen inches on the longest side. Send the model, with a description of its merits, by express or otherwise, to Munn & Co., 37 Park Row. Also remit to their order by draft, check, or postal order, the money to pay expenses, which are as follows: For a five years' patent, $50; for a ten years' patent, $75; for a fifteen years' patent, $100. The five and ten years' patents are granted with privilege of extension to fifteen years.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars, address MUNN & Co., 37 Park Row, New York.

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Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

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—:o:—

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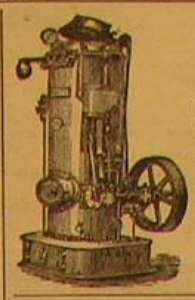

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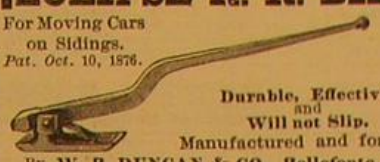

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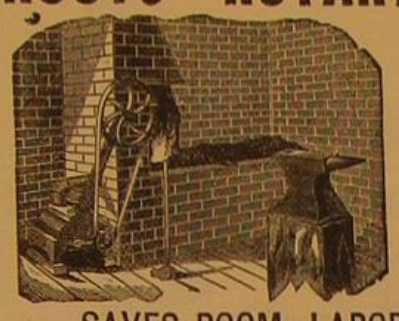

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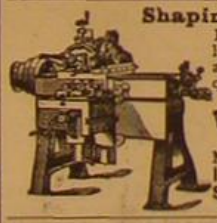

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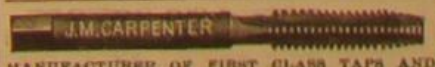

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I.—THE LETTER WRITER OF SEVILLE. This picture presents most forcibly the contrast between Spain and our own blessed land—between education and ignorance. Imagine one of our American girls confiding to another the subject matter of a communication with a dear friend, as this dark beauty seems to be doing! Her position and expression are most natural, and so too is the attitude of the old scrivener, whose ear, he undoubtedly assures her, is the grave of secrets. The other figures are life-like, and the whole picture is pleasing.

II.—THE CROSSING SWEEPER. A scene familiar enough to dwellers in New York in the winter season. The faces are not common ones. The boy's is that of one likely to make his mark in the world. The lady's is full of goodness; but her attention is absorbed by an approaching vehicle which she must escape, and she does not see the earnest countenance lifted so respectfully to hers.

III.—THE ROYAL PRINCESSES, CHILDREN OF GEORGE III. From the picture in the Royal Collection—painted by Copley, of Boston, for George III.—Mary, Sophia, Amelia. One of the most graceful and charmingly natural portrait groups anywhere to be seen.

IV.—THE SKEIN WINDER. A domestic scene of the old Roman time. An original subject, and treated in an agreeable manner. Most of our readers will recall similar experiences. The poet Longfellow cites, in his "Courtship of Miles Standish," a scene of the kind, but much more romantic.

V.—THE SPANISH SISTERS. From a painting by J. Phillips, of the Royal Academy, and one of his best. The contour of faces—bright black eyes, olive complexion, costly embroidered silks, rich lace veils, identify them as "Spain's dark glancing daughters."

VI.—A REST ON THE HILL. A fine bit of unsophisticated nature. A young farmer's wife is returning from town with her purchases. It is a hot day, and she has seated herself to rest for a few moments on a bank under a large beech tree, not far from her house, which is seen in the distance. Her bonnet has been thrown off, and she and the little one are evidently having a good time.

VII.—THE FAIR CORRESPONDENT. Washington Irving touched a chord that vibrates in the consciousness of every intelligent individual, when he said he thought one of the joys of heaven would be to receive letters by every post and never have to write a reply! Something, however, would depend on the writers and the nature of the letters. We think the person who is to be favored with the confidence of the clear-eyed, wholesome-looking English girl before us, should reckon indeed the first part of the proposition to be true, without the closing condition.

VIII.—BARTHRAM'S DIRGE. This subject appeals to an entirely different set of sympathies. Scott's Border Minstrelsy supplied the theme. The central figure is that of a young nobleman shot to death by nine brothers, whose sister he had dishonored. He lies on a leafy bier at the foot of the altar, attended by two of his faithful vassals. The lady whose heart he had won looks on with terror, wonder and grief depicted in her countenance.

IX.—GOING TO SCHOOL. This subject needs little exposition. Shakspeare's schoolboy never dies. We all remember him! The grouping in the picture is admirable, and the different expressions make an entertaining study. One early bird is intent upon catching the intellectual worm; one pours over his book as he walks along; while some of the others enjoy themselves as they go, regardless of books or lessons.

X.—PEEP-O-DAY BOYS' CABIN. The home of a guerilla freebooter. He has just returned from a night's adventure and is sleeping, his wife meanwhile keeping watch. The composition is forcible, and the accessories of the picture afford opportunity for considerable study. The original painting is one of Wilkie's best.

XI.—THE SCANTY MEAL. A very pleasing and natural picture. The horses' heads are exceedingly well drawn, and we almost see the coarse hay, what there is of it, disappear before our eyes in their capacious jaws.

XII.—THE AMAZON. A portrait of Helena, fifth child of Queen Victoria, at about five years of age. The character is a pretty conceit, though the comparison is rather by contrast than similarity.

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