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THE MANUFACTURE OF SHOT.

Lead shot, though sometimes made of lead alone, are almost always formed of an alloy of arsenic and lead, the arsenic being introduced in the form of arsenious acid or the sulphuret (orpiment). The object of the addition of the arsenic is to render the hard brittle qualities of the lead, which is contaminated by iron and antimony, softer and more ductile and of the proper consistence, when melted, for taking the globular form. Owing to the rapid decomposition of the arsenic it is treated by itself in the bottom of the melting kettle shown in Fig. 5. A cover is placed over the substance, and its stem, which rises up through the kettle, is fastened down. The lead is then added above the cover, and when melted the cover is lifted out of the liquid mass, which instantly becomes permeated by the arsenic beneath. The alloy thus produced contains 45 lbs. of arsenic to the ton of lead, and is known as "temper." This again is added in the proportion of 1 per cent to the pure lead, and thus the shot alloy, containing a very small percentage of arsenic, is produced. The making of quantities of the temper at a time is a great convenience, as the proportion of arsenic in the shot is thus kept uniform while the melting can be done in the ordinary kettle in the summit of the shot tower. The temper pots hold about a ton of metal each, and the cooled product has a brownish gloss distinguishing it in marked manner from the dull hue of the pure lead.

The ascent of a shot tower cannot be commended as either agreeable or interesting. To go round and round a spiral staircase, just wide enough for the body and no more, is to get into a bewilderingly dizzy state. Besides, after developing about one fourteenth of a horse power with one's leg muscles, a sensation of fatigue follows, which is not easily got rid of. After the visitor has reached the uppermost story and regained both his equanimity and his wind, he is treated to a new sensation, which becomes the more marked in accordance with the force of the prevailing breeze. The tower rocks like a ship at sea—sometimes so much as to dash some of the molten lead out of the kettle. Of course there is no danger, because the edifice is usually constructed with an iron frame, which is not only strong but elastic, while the brick filling gives additional stability. But, as at the famous tower at Pisa, to the summit of which no one probably ever ascended without, on looking over, involuntarily recoiling with the expectation that the edifice surely was about to fall; so, in the shot tower, one's powers of perception and reasoning faculties are at direct variance: and nervous people are liable to receive a disagreeable shock in consequence.

Up in that lofty apartment (Fig. 1, represented in our large engraving) the visitor finds two men, their hands incased in thick bags, and grasping heavy iron ladles with which they dip out the molten metal from the kettle, and pour it into the collenders. Here is the source of that dazzling stream, which, passing down through the center of the structure, salutes the climber of the narrow stairs at every turn. Blistering as the molten metal is, the men dash their ladles into it as if it were water. This is hard labor, and rapid besides, for the lead runs through the collender almost like quicksilver: while if it is allowed to become a little chilled in the

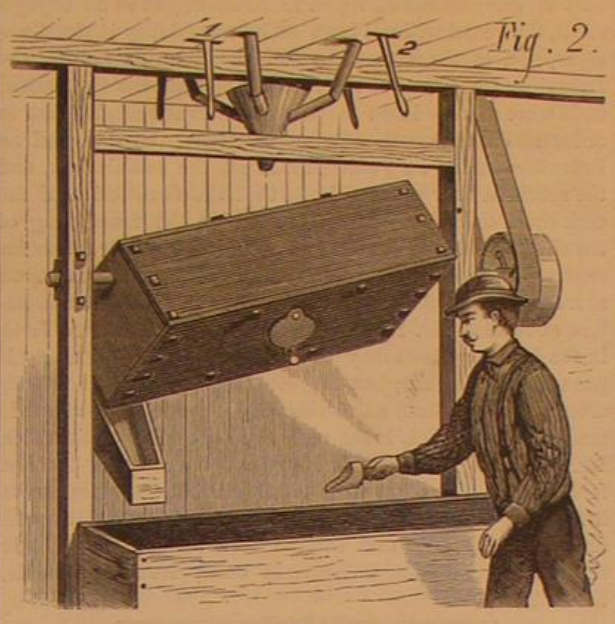

Fig. 2.

bottom of the vessel, then the holes are stopped, and the careless workmen have no easy job in cleaning them. Five tons of lead are often thrown down in half an hour in the establishment we visited. The collender is simply a copper pan, the bottom of which is perforated and which rests in an iron ring. A long handle from the latter allows of the collender being fastened over the well. In the bottom of the collender is placed a layer of the dross which rises to the surface of the lead during melting. This in a measure checks the too rapid escape of the melted metal, and is thought to have the effect of increasing the rotundity of the shot, possibly by expediting its cooling as it passes through. The holes in the collenders vary from $\frac{1}{60}$ to $\frac{1}{32}$ of an inch, but the shot are of larger diameter than the orifices. In falling to the base of the tower the particles of semi-fluid lead, acted upon alike over their whole surface by a current of air, are made to assume the globular form, and by the time they reach the bottom they are sufficiently hardened by cooling to bear the shock of striking the surface of the water in the well below.

The size of the shot is only approximately fixed by the sizes of the holes in the collenders. The mass is always larger than the hole from which it exudes, and as the period of dropping is not exactly uniform, perhaps half a dozen sizes are produced from the same sieve. Again, large sized shot require to be dropped from a greater height than small sized, and while in some cases 100 feet is sufficient, in others an elevation of 150 feet is hardly enough. Buck shot, as will be explained further on, are not made by the dropping process at all, owing to their size. Various devices have been proposed for shot-making, having for their object the abolition of the tower. One process consists in pouring lead upon a revolving table on which is placed a cylinder of perforated sheet brass. The table is revolved with a velocity of 1,000 feet per minute on the periphery, and the lead is thrown through the perforations on the side, forming round shot, which strike against a linen screen placed to intercept them. A method has also been patented in this country for dropping shot through short distances but subjecting them meanwhile to a powerful air current which cools them.

After the shot have reached the bottom of the well, they are at once lifted out by an elevator and thrown upon an inclined drying table over which they slide, falling ultimately into a wire gauze rotating cylinder. Here they are rolled and ground together, and in this way the minute burrs upon them are removed. From the cylinder another elevator lifts the shot upon a screening table, Fig. 3. This consists of a series of planes arranged at gradually decreasing heights. Between each there is an interval. The shot being started at the end of the highest plane will, if perfect, roll from one plane to another, jumping over the intermediate spaces; if imperfect, however, the latter become pitfalls, into which, sooner or later, it tumbles and is carried off into a receptacle, the contents of which go back to the melting kettle. The good shot, after passing this ordeal, reach the separators. It should be explained that there are usually several tables, each being devoted to a different size of shot and its approximating sizes. This

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THE MANUFACTURE OF SHOT. POURING THE MELTED LEAD.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 82,
For the Week ending July 28, 1877.

THE LATEST BRITISH NAVAL FAILURE.

A strange fatality seems to attend the vessels of the English navy. For more than two years past accidents and blunders have occurred so repeatedly in the finest and presumably best built ships that the conclusion appears imminent that the superior skill of English ship constructors, engineers, and seamen is fast leaving them. Not long ago the Orontes, a splendid new troop ship, after a highly satisfactory two hours trial of her engines, was sent to St. Helena. Hardly had she started on her voyage than (to quote the *Engineer*) "the engines broke down utterly, and the ship is now lying disabled in the harbor."

But the hugest blunder of all, if we may credit Mr. E. J. Reed, the late chief constructor of the navy, has been perpetrated in the designing of the famous Inflexible, supposed to be the most powerful vessel of all the English ironclads. She is built on the citadel principle; that is to say, she has a heavily plated central portion wherein are guns, machinery, and magazines. Before and abaft this strong portion the ends are unarmored, it being considered that even if such portions are destroyed in action the fighting capacity of the ship will be none the less. But now Mr. Reed says that if these ends do happen to be destroyed in an engagement, the vessel will not have sufficient stability to stand upright, and in short that she will capsize. On visiting the Inflexible from time to time he found that the unarmored ends were so very large in proportion to the citadel that in order to determine the doubts suggested, he designed an Inflexible in his own office, made all the calculations, and the result he now affirms shows that the destruction of the cork-lined extremities would determine the foundering of the ship. As the Inflexible has been under construction for nearly four years, and as two similar ships have been begun at a cost of about 6 million dollars, John Bull's consternation at reading Mr. Reed's damaging assertions spread forth in the London *Times* may be imagined. The Admiralty is put upon its defense; but *Engineering*, after reviewing both sides of the question, admits that the "position of affairs is most serious." This is the second disagreeable truth which Mr. Reed has presented to his countrymen within the last few weeks. The other was that England did not possess an ironclad which could not be promptly destroyed by well managed torpedoes, and that in view thereof the quicker she stopped building enormously costly iron war vessels, the better.

GLIMPSES OF ATLANTIS.

The sedimentary rocks of our Atlantic States aggregate a thickness of nearly 45,000 feet. The manner in which the sand, gravel, mud, and so on, which formed these rocks, was distributed over the bed of the sea which rolled where our continent now lies, proves beyond a doubt that they came from the north and east. They represent the detritus of pre-existing lands, the washings of rains, rivers, coast currents, and other agencies of erosion; and since the areas supplying the waste could scarcely have been of less extent than the new strata it formed, it is reasonably inferred that land masses of continental magnitude must have occupied the region now covered by the North Atlantic before America began to be, and onward at least through the palæozoic ages of American history.

It is not to be imagined that the ante-American sea was 45,000 feet deep. When the earlier palæozoic strata were forming the water was evidently shallow, and in some parts broken by islands. From time to time the sea was deepened by the sinking of its floor; and as the successive strata were laid down the subsidences for the most part more than kept pace with the thickening deposits. Now and again the movement was reversed, as when the Green Mountain range was uplifted; and occasionally deposition exceeded subsidence, or slight elevations brought the sea bed near to the water level. Previous to the carboniferous period evidences of shallow water are common; and after that time successive low-level land areas repeatedly occupied the eastern half of what is now the Mississippi basin.

While the new America was thus forming the ancient Atlantis was no doubt sinking as well as washing away. When its final disappearance occurred remains to be determined; quite recently, however, two or three lines of scientific research seem to converge in support of the truth of the ancient story, long considered mythical, in regard to the geologically recent occurrence of that remarkable catastrophe. Archæo-geology has sufficiently demonstrated that the memory of man runs back vastly farther than history has been willing to admit; so that there remains no inherent improbability in the story the Egyptian priests told to Solon. All that modern science asks is, whether there is any other evidence of the recent existence of Atlantis.

Since the exploration of the North Atlantic sea bottom for telegraphic purposes proved that no elevations or depressions inconsistent with the safe laying of cables were to be found between Newfoundland and Ireland, it has been popularly taught that the Atlantic lies in a vast trough with a comparatively regular bottom. A wider range of soundings made by the American ship Dolphin, the German frigate Gazelle, the British ships Hydra and Porcupine, and more recently by the Challenger, quite overthrows the popular idea, proving the Atlantic bed to be rather a double trough, the deeper depressions separated by a mountainous ridge of great altitude running north and south, almost midway between the existing continent. From the variations in the soundings along the ridge there is every reason to infer that it is a line of broken country, the higher peaks reaching the surface north of the equator in the Azore Islands, and further south in St. Paul's Rocks, the Islands of Ascension, Tristan d'Acunha, etc. On the other side of the ridge the water deepens, the bottom presenting a surface diversified by hills and valleys, such as could be carved out only when the sea bed existed as dry land.

From the soundings made and collated by the officers of the Challenger expedition, a chart has been prepared, showing by soundings, first, the Atlantic areas having a depth of over 2,000 fathoms, and second, the areas ranging between 1,000 and 2,000 fathoms: the narrower areas having a depth of less than a thousand fathoms, showing white. By far the greater portion of the sea bed south of 50 N. L. exceeds the depth of 2,000 fathoms. The area of medium depth covers the northern sea down to an irregular line between Newfoundland and England. Thence a narrow isthmus (beginning about 52° N. L., and 30° W. Long. from Greenwich) connects the northern table land with what has been denominated the Dolphin Ridge—a seal-shaped area with its head to the north and its tail joining (at about 15° N. L. and 45° W. L.) another ridge called the Connecting Ridge. The latter puts out from the South American shore just north of the Amazon's mouth, and extends from about 19° N. L. and 50° W. L., southeastward to a point on the equator about Long. 10° W., where it turns abruptly south and forms the Challenger Ridge, which broadens southward, but is not mapped below 40° S. Lat. Just north of Tristan d'Acunha the Challenger Ridge sends off an arm, which, curving to the northeast, joins the coast of Africa.

Here unquestionably we have the backbone of the ancient Atlantic continent; and in a recent lecture in London one of the Challenger staff has reviewed the evidence of soundings touching the general contour of the "lost Atlantis." Its valleys and hills are not such as could be formed by any natural irregularity in the deposition of sediments, nor by submarine elevations; they have been carved by agencies acting above the water level. Along the ridge there are four points which remain unsubmerged—the Azores, St. Paul's Rocks, Ascension, and Tristan d'Acunha. In the deeper basins, the Bermudas, Fernando de Noronha, Trinidad, and St. Helena rise to the surface, in some instances not far distant from depths exceeding 3,000 fathoms. A group of such soundings under the equator (not far from where the general ridge makes the angle separating the Connecting Ridge from the Challenger Ridge) give evidence of an ancient valley line. Supposing the continent raised until this valley became dry land, the high peaks (now islands) near by would rise to Himalayan heights, and the ridge itself would average about 1,500 feet. Even under the equator such elevations would be capped with snow, if the atmospheric conditions were at all as now. The lower levels along the mountain ridge would present every variety of climate, according to the height; and with such a line of communication many serious problems of plant and animal migrations across the equator during the geologic ages could be easily solved. In the North Atlantic regions the general elevation of the ridge is probably not more than 9,000 feet, unless the original depths are masked considerably by a deposit of globigerina—ooze.

Thus deep sea exploration confirms the report of geology that Atlantis really existed; and palæontology also bears witness to the same great fact. Still more, it testifies that the final disappearance of the buried ridge did not occur until comparatively recent times. The evidence on this point was reviewed some eight years ago by Professor Unger, who had been led to believe that a land connection must have existed between Europe and America, as late as the tertiary period, by a comparison of the recent and fossil floras of the two continents. Other evidence of like nature may be found in Professor Gray's review of the history of the gigantic redwoods (*sequoias*) of California, reprinted in "Darwiniana."

With such support the traditions of the ancient world, on both sides of the Atlantic, begin to read like something more than empty myths. The Egyptian priests, it is more than likely, were reciting veritable history when they told Solon about the islands of continental magnitude that formerly existed in the outer sea beyond the pillars of Hercules, but had sunk beneath the waters. And it is not impossible that the mighty kings of Atlantis may have invaded Europe and Africa, as the Egyptian books narrated, and overrun those countries as far as Greece and Egypt.

The story of the sinking of Atlantis during a time of floods and earthquakes was preserved with even greater fulness of detail on the American continent, if there is any truth in the representations of Brasseur de Bourbourg. That student of Central American monuments and traditions asserts that not only was the story of the submergence of a great country to the eastward widely spread among the natives and frequently referred to in their writings, but that seasons of humiliation and prayer were observed in commemoration of such disasters—both princes and people humbling themselves before their divinity and praying that the calamities which had overtaken their ancestors might never be repeated. These great convulsions are specially dwelt upon in the Indian traditions, and one or two minor ones are mentioned, when the land was shaken by frightful earthquakes and the waves of the sea combined with volcanic fires to overwhelm and engulf it. By these convulsions the land was swept away and submerged, but few of the inhabitants escaping in boats or finding a refuge on the tops of high mountains.

To the evidence of tradition de Bourbourg adds that of language. The words *Atlas* and Atlantic, he says, have no satisfactory etymology in any language of the Old World. On the other hand, the radicle *atl* is characteristic of the

Nahuatl language, which played so important a part in Mexico and Central America. It signified water, war, and the top of the head, and furnished a series of words, such as *atlan*, on the border of or amid the water; also *atlaça* (preterit, *atlas*), to combat or be in agony, and to hurl or dart from the water. *Atlan* was the name of a native city at the entrance of the Gulf of Uraba, in Darien. The same combination appeared also in *Quetzalchohuatl*, the name of the quetzal plumed serpent god of the Aztecs.

We are not aware of any geological reason for doubting the possibility of the lingering of Atlantis as an archipelago down to post-tertiary times, and its final submergence within the period since man appeared. The probability of its continuance hinges entirely on the credibility of human traditions. In the absence of conflicting evidence, the concurrence of testimony from people so widely separated as the ancient Greeks and Egyptians on the one side, and the Central Americans on the other, may in some minds count for a great deal. At any rate it must be admitted that Atlantis *has existed* as a substantial reality.

AN ENGLISH MECHANIC ON AMERICAN MACHINES.

Dr. John Anderson, C. E., contributes the report on machines and tools for working wood, metal and stone, at the Centennial, to the recently issued volume of reports of the British Commissioners and Judges. As one of the most eminent of English mechanics and engineers, and besides an observer of much acuteness and intelligence, Dr. Anderson is capable of pronouncing a just opinion of our productions —one indeed which Americans will look for with interest and read with respect. Most of Dr. Anderson's report is taken up with descriptions of machines which especially impressed him, and which need not be noted here. He has a straightforward way, however, of telling what he thinks, that enables us to convey pretty clearly the drift of his opinions by a sentence now and then abstracted.

As was the case with most of our foreign mechanical visitors, Dr. Anderson was first struck by our multiplicity of special and labor-saving devices. The invention of these he thinks is our "natural forte and worthy of the old stock probably quickened by the peculiarly favorable circumstances under which they live. It was the display made in this section of the exhibition which most conspicuously brought out the enormous strength of America as a producing power." "No mere words," he says, "can convey an idea of the high standard of excellence of American watch making machinery. Sellers' tools were without a parallel in the history of exhibitions either for extent, money value, or for originality and mechanical perfection." For torsional, tensional, and malleable qualities the samples of American iron and steel "were equal to the best of any country." "The impression is left upon the minds of European visitors, that American competition in machine tools will soon be upon us, but that the competition will not be in regard to price, but rather for high quality and productiveness and the capabilities of doing more work with a given expenditure on labor." The concluding paragraph of the report which is the conclusion drawn from the whole, is suggestive.

"In past times England has been the nursery ground of the manufacturing system, her factories have been visited and her system of cotton and other textile manufactures copied by all nations, but the time seems to have arrived when we shall have to visit America in the same way and for the same purpose, in regard to the production of other things, and there is no time to be lost if we mean to hold our own in the hardware trade of the world, at least in regard to the class of things that are required in large number or quantity. * * When we consider the enormously greater area of the American continent, it is a matter of vast importance, that tools have taken such a hold on the American mind which will influence the civilization of the Western world for ages to come, and will exercise a powerful effect not only on that continent, but on Australia, China, and the world generally: this therefore has a profound significance which can scarcely be overrated."

PROGRESS OF THE MISSISSIPPI JETTY WORKS.

Captain Eads' latest report of progress upon the improvement of the South Pass of the Mississippi river is most gratifying and leaves no question as to the ultimate triumphant success of the entire great work. Careful examinations have been conducted from time to time with the result of showing a steady increase in width and depth of the channels, thus bringing to Captain Eads' theories the strongest confirmation. For two years work has now been going on upon an unused outlet of the vast river. Up to the present time the concentration of the water flowing across the sand bar at the mouth of the Pass by the jetties has created a channel over 200 feet wide and in no place less than 20 feet deep, where only about 8 feet previously existed. The concentration of the water flowing over the shoal in the river at the head of the Pass has likewise created a channel over 400 feet wide, in no portion less than 20 feet deep and 30 feet deep in the center, where before the depth was scarcely 14 feet. During the time in which a portion of the flow into the Pass was interrupted by the works at its head, and while the current consequently slackened, Captain Eads states that a temporary deposit took place in the Pass and between the jetties. But the gradual restoration of the normal flow into the Pass through the new channel at its head has already begun to enlarge the Pass again and, continues the report, "has, since this restored flow commenced, removed from between the jetties within the past three months over half a million cubic yards of deposit, and given through more than half the length of the jetties a much larger and deeper channel than ever previously existed, the size of which is already throughout more than 2,000 feet, 28 feet by 300 feet, or that required to entitled us to the fifth payment from the United States, while many hundred feet of it exceeds 30 feet by 350 feet."

The reformation of the bar in advance of the jetties, which many engineers believed would occur, is effectually prevented by the gulf current athwart the mouth of the Pass, which deepens the outer slope of the bar and sweeps away any such portion of the discharged sediment as the river current fails to carry to unknown distances seaward. At the head of the Passes the river has a width of over 9,000 feet, and yet is brought under complete control by Captain Eads' works, which are so designed as to allow of the increase or limit of the discharge into the South Pass if hereafter necessary with but little additional outlay. Captain Eads concludes his report and at the same time announces the splendid success which has crowned this application to his genius and ability in the following terms:

"I may add with absolute certainty, that this entire system of works is now so far completed that no financial difficulties can intervene to arrest the processes of nature which are constantly operating to enlarge and perfect the desired channel through them.

AMERICAN REPRESENTATION AT THE FRENCH EXPOSITION.

There has been some doubt expressed recently as to whether the Paris International Exposition would take place in 1878, it being surmised that the unsettled condition of affairs in Europe would render its postponement necessary. Late advices, however, show that there is no basis for this supposition, and that the work of erecting and making ready the buildings is being vigorously prosecuted. The N. Y. *World's* correspondent states that the masonry and brickwork are in place, that the great iron works of Creusot and Fives-Lille are competing in the matter of rapidity of erecting the frames of the structures, and that the French Commissioner General has officially announced the certain completion of all by the spring of next year. All nations with the exception of Germany and the United States, have accepted invitations to participate and have already entered upon the organization of their representative displays. Even Russia and Turkey, despite the war, are to take part.

Germany's refusal to contribute is owing to the unhealed breach between herself and France. Our own failure to make the necessary preparations to ensure the representation of our industries is, as is well known, due to the failure of Congress to attend to the matter before adjournment. It is stated that already large numbers of Americans are in Paris endeavoring to make arrangements as to space, etc., and that on the other hand, the "French are burning with desire to strain a point in favor of Americans by recognizing any body of men, or any invividual having a shadow of official authority, but until that person shall appear they are obliged to hold that the United States is non-existent for the purposes of their mighty show."

It seems to us that if this view of affairs is correct a great deal of regret over the so-called negligence of Congress is being wasted over here. Let the representatives of American manufacturers, who "run from the legation to the office of the French Commission and back again without finding anyone to give them a helping hand," help themselves. Let them organize their own commission and apply to the President for official recognition. We do not see that any further formalities are required, at least in the face of the statement quoted in the last paragraph. Then let them or their principals furnish money and invite subscription from every one who is interested in having an American display in the show, and with the funds so raised go ahead. It is getting to be an altogether too prevalent notion in these days of World's Fairs that we cannot get up a respectable display of our productions without an appropriation and a new army of office holders to spend it. Our unfortunate experience at Vienna goes to prove the fallacy of this even if to every thoughtful person the same were not already apparent. It is radically absurd to sit grieving over what Congress did not do, when the way out of the difficulty is perfectly clear, and it is more absurd to wait for the possible action of Congress in granting money when it meets next winter. Even if money appropriated in December would not come too late to secure a proper official organization, in the present state of the national finances, when retrenchment is everywhere being enforced, Congress should not devote a cent to assisting any one or any class of the people to advertise themselves in Paris.

FAST FREIGHT RAILWAY TRAINS.

The subject of moving freight at faster and cheaper rates was one of the principal topics of discussion at the late meeting of the master car builders' association. The competition of water conveyance, together with the general depression of business, makes the demand imperative that there be some method by which freights may be moved at cheaper rates than those now employed. The solution of the problem is one that effects, not only railway companies, but the public at large. Stockholders are interested in a fair percentage for the stock they hold, while the public are more interested in some cheap, yet rapid method of conveying goods and agricultural products to their various points of destination. To those railways that come in direct competition with lake, river, and canal transportation, the demand is imperative, that to secure returns to stockholders, some energetic action must be taken that will enable them to lower their rates of transportation.

It is claimed by some railroad men, and men, too, who have had long and varied experience in such matters, that it is more economical to run freight trains at a high rate of speed, say twenty-five miles per hour, than to run a train a one half that speed. This will be one great benefit in the competition with the water routes. The advantages claimed for this high speed are, that when a train is once under way less fuel is consumed, and less power is actually expended than when moving at the low rate of speed. In proof of this, experiments were made on the Lake Shore Road. An engine with dynamometer attached was run from Buffalo to Chicago and a record kept the entire distance, both at twenty-five miles per hour and at twelve miles. The fuel was weighed and everything recorded that was thought of value. The result showed that in economy of fuel, the fast speed had the precedence. Resulting from this is the economy of power in moving a train at quick speed, as, after once started, less power is required to keep the train at that speed than if kept running at a low rate of speed, as, at the less rate, the engine is kept under strain twice as long, and during this time a large amount of heat is lost by radiation. With the fast speed, the train hands would be on duty but half as long and a consequent saving of wages paid, and finally but half as many cars would be required to transport the same amount of freight.

With fast speed trains, it will be necessary to look well to track and rolling stock. If the track be high in some places and low in others, causing the train to be tossed from one side to the other, it will result in wear and destruction. Car wheels must be round and not eccentrics. With the movement of the train these defects will be augmented and result in danger and damage. It was said by an official, who was connected with a very important line: "If you car men will give us the control of our trains through some continuous train brake, we will dispense with from one third to one half of the number of cars now in use, we will transfer grain from Chicago to New York in one half the time we now do it in, we will move our trains at less cost to you for repairs, as has been demonstrated by trains running over this line for a series of years at twenty-five miles per hour termed 'immigrant trains.'" He also said, that the repairs on these trains is less per number of cars than in the trains moved at twelve miles per hour.

Surprising as may seem the statements made before the association, the facts of the economy of fast speed freight trains was acquiesced in, but it was thought advisable not to attempt such high rates of speed unless these trains were equipped with suitable train brakes, and the engine and tender provided with steam brakes always ready for application.

Nordenskjold's Next Expedition.

For Professor Nordenskjold's expedition, which is to set out from Gothenburg, in Sweden, in June, 1878, a vessel has already been chartered for 150,000 Swedish crowns (about $25,000). King Oscar has contributed 50,000 crowns from his personal revenue, but the burden of the expense will be borne by the friend and patron of Nordenskjold, a merchant of Gothenburg named Dickson. The route of the expedition will be from its starting point to the North Cape, thence eastwardly through the Polar Sea to and through Behring's Strait, thence along the eastern and southern coasts of Asia, through the Red Sea, the Suez Canal, and the Mediterranean Sea to the Atlantic Ocean, and return home in the autumn of 1879.

Smoke Screens for Torpedoes.

History is repeating itself again. In his veracious chronicle of New York Mr. Diedrich Knickerbocker says that, when an English ship sailed into the harbor, and arrogantly demanded of the primeval Dutch, the prompt surrender of their possessions, that portion of the phlegmatic population which had settled in Communipaw raised such a cloud of smoke from their huge pipes that the piratical British never discovered their existence in the midst of the dense fog. A similar plan is now proposed for the protection of torpedo boats from the fire of an attacked ship. Hale's rockets are to be provided with smoke balls and these discharged from the launches on igniting envelope both the assaulting craft and that assaulted in such a thick cloud that it will be practically impossible for the latter to use her electric light with any efficacy, or to sight her guns at her concealed antagonists.

American Institute Exhibition.

Our manufacturers are now fully awake in the matter of exhibitions (thanks to the "Centennial,") and so far as their limited space is concerned, we are assured the coming exhibition of the American Institute of this city will be of more than usual value and novelty. For information address the General Superintendent.

RECEIPT FOR HOG CHOLERA.—Take one teacupful of pulverized copperas and mix with one gallon of salt; and salt the hogs twice a week regularly. This is said to be a sure preventative, and has been known to cure in many instances after the disease has commenced.

PARTIES desiring information in regard to the horse-collar stuffing machine, illustrated in last number, will address Mr. B. F. Grayson, Jr., Luray, Page county, Va.

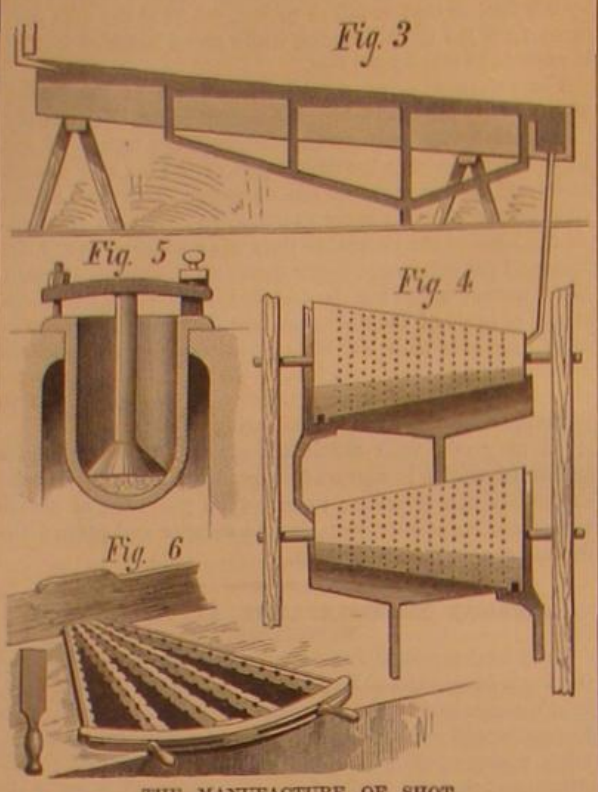
[*Continued from first page.*]

is for convenience in future separating. The shot are next elevated to the top cylinder of a series, arranged on an incline. Two of these cylinders are represented in Fig. 4. They are conical in form and inclined, and are covered with perforated sheet brass. Each cylinder serves as a sieve for a particular size of shot, retaining that and allowing all smaller sizes to escape. The shot, as the cylinder revolves, traverse its entire length, and then the small ones run out into the next cylinder below, and thus the sifting goes on until each cylinder has picked out the particular class of shot to which it is adapted.

The sizes of shot are standard. The smallest is known as "dust," and then comes No. 12, which is 0·05 inch in diameter, 2,326 shot going to the ounce. The sizes then increase by one-hundredths of an inch to up to twenty-three hundredths, of which there are 24 shot to the ounce.

The shot being now assorted, polishing alone remains to be done. This is accomplished by placing the shot together with plumbago in the box, Fig. 2, which is rapidly rotated. This imparts the glossy black smoothness demanded by sportsmen. The shot are then weighed, bagged, and are ready for commerce.

Buck shot, which range in size from twenty-two to thirty-eight hundredths of an inch, are moulded. The moulds represented in Fig. 6 consist of a series of pivoted bars, the outer pair of which have handles. The upper edges of these bars are hollowed to form the moulds, so that when they are closed together, the opposite halves of each cavity unite, and it is only necessary to pour the lead into the apertures. The shot are thus at once moulded to the proper size, so that rumbling and polishing only are subsequently required.

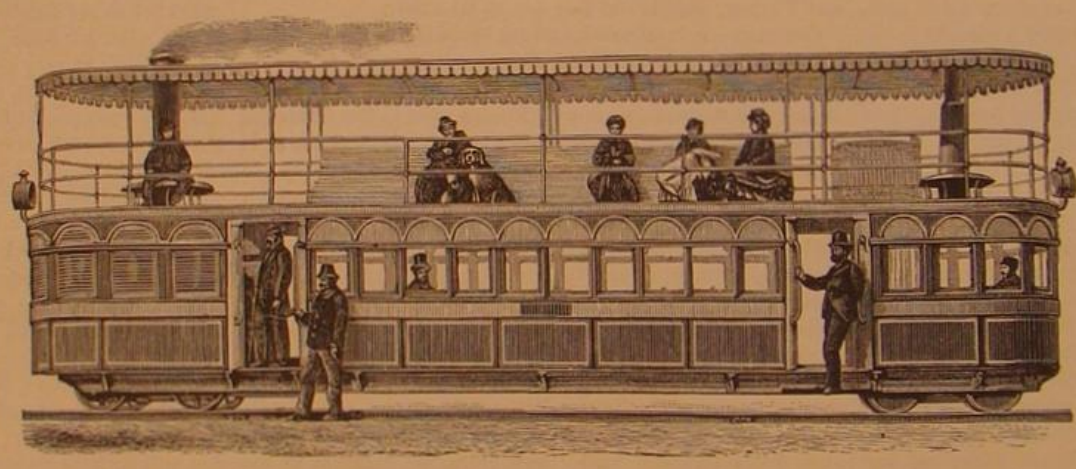


THE MANUFACTURE OF SHOT.

A SWISS STEAM TRAMWAY CAR.

In the annexed engraving, from *La Nature*, is represented a steam car used on the route between Lausanne and Echellens, Switzerland. The length of the line is nearly nine miles. There are numerous curves; some having a radius as small as 62 feet. The speed at which the car travels is about 15 miles per hour, and the time of passage, including eight stoppages, 50 minutes. The steam engine and boiler is located in one end of the vehicle, similar to the Philadelphia street steam cars, and directly over the trucks. The heating surface of the boiler, according to the builder, M. Brunner, is 143 square feet, corresponding to a motive power of 25 horse. The consumption of fuel is 220 lbs. per trip. Coke is used in the towns, and soft coal during the journey. The tractile power is 1,650 lbs., and the car can be stopped by its brake within a distance of 20 feet.

The vehicle has two stories, with 24 seats in the lower one, and places for 32 people on the deck. Eight more passengers can be carried in the lower end compartment. No turn-tables are used, the car running in either direction. The total length is 41·2 feet, breadth 7·6 feet, height 13·7 feet. The weight, empty, is 11·5 tons; or, with a load of 64 persons, about 16 tons. There are many branch roads in this country where a car similar to the above might be used, and a great saving be effected in cost over the locomotive and ordinary cars now employed.

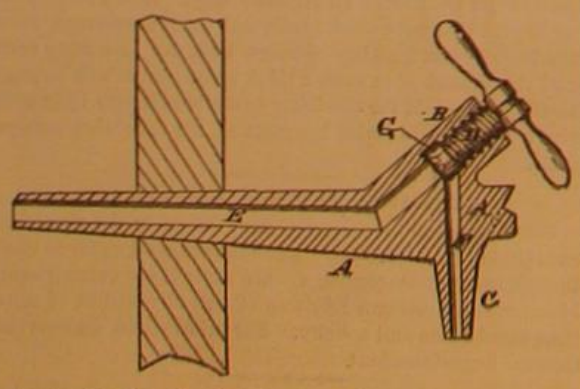


SWISS STEAM STREET CAR.

IMPROVED FAUCET.

This invention is designed to furnish a faucet so constructed as to prevent leakage, and enable the valve-packing to be readily renewed should it become worn.

In the engraving A represents the receiving tube, B the key seat, and C the discharge pipe. The passage, E, through the receiving tube near the outer end of the faucet, is inclined upward at an angle of 45°, so as to meet the lower end of the key, D. The passage, F, of the discharge pipe, C, passes down vertically entering the cavity of the key seat, B, at an angle of 45°, and just above the vent of



the passage, E. The key, D, screws into its seat, and has a rubber button or packing, G, secured detachably to its forward end by a small screw. The rubber button, G, is unaffected by the liquor, consequently it lasts almost as long as the metal parts of the faucet: but, should it become worn or frayed by use, it can readily be detached by removing the small screw, and replaced by a new one.

Patented through the Scientific American Patent Agency April 2, 1877, by Ralph Hathaway, of Memphis, Tenn.

Esquimaux Implements.

In looking up objects of interest in my museum at South Kensington for the Westminster Aquarium, I have re-arranged a very nice collection of Esquimaux implements. These were obtained from the Esquimaux at Kotzebue Sound, Behring's Straights (latitude 70°), Arctic Ocean, and presented to me by Commander Hill, R.N., June, 1865. These articles are as follows: A set of instruments used for producing fire. These consist of a bow made of walrus tusk, a round piece of stick like a large cedar pencil, and a piece of wood with cavities in it, corresponding with the end of the stick. The stick being worked very quickly by means of the bow like a drill, smoke and then fire ultimately ensue. Neither Mr. Searle nor myself can produce the fire, but can make the top of the drill very hot. To the Esquimaux, who have no lucifer matches, this fire-stick must be of the greatest importance.

Tusks of the walrus are of the greatest value to the Esquimaux. We observe in the collection several articles made of this—namely, a netting-needle, the same as our own—three other needles—I cannot conjecture their use. They are about eight inches long, pointed at one end, blunt at the other, and a small hole bored through them about half way down. There is also another walrus ivory implement, used for plaiting or twisting lines. There are four hooks very unlike the hooks used by civilized nations. They are in the shape of a letter U, with a barb running down from the top of one side nearly across to the center. The hook is made of some very hard bent wood, but the barb is made of bone or ivory, and very sharp pointed. There are two kinds of baits, namely, a rough imitation of a fish, also in bone, which is evidently a spinning bait. Holes are drilled down the side, what the exact use of these is I am unable to determine. A very interesting specimen of a harpoon demands our attention. It consists of a heart-shaped termination. The edges of this weapon are very sharp, and are made of a portion of some shell. The material into which this shell is set is, I have ascertained by burning, to be some resinous gum, a native-made rope with two barbs of bone standing backwards is let into the hollow of this harpoon, and cemented fast by the gum. The strength evidently is trusted to the barb, the line and the shell are used for the lancing and penetrating purpose. The use of the flying lasso (or bolas as called in South America) is not unknown to the Esquimaux. It consists of strings made of the intestine of some animal; to the end of each string is attached a heart or pyramidal shaped bit of walrus tusk, about the size of a walnut; one has eight ends to it, the other nine. The bolas is thrown by hand. It is first of all twirled two or three times round the head; and then is sent flying through the air like a large cobweb; it will lap round any object it meets with the greatest quickness; it is used by the Esquimaux for catching birds. I think the idea may be applied to catching such birds as partridges. It would require some skill and practice to use it properly, but therein it would cause some sport. At the ends of each bolas are attached a few birds' feathers. In order to avoid the terrible glare of the Arctic snow, we find the Esquimaux have invented snow spectacles. These consist of a piece of wood cut out in the shape of a spectacle; where the glass should be in ordinary spectacles we find two very fine slits. This apparatus I should think would be admirably adapted to drivers of railway engines, who have to encounter snow, wet, and hail, as the engine rushes through storms at express pace. The eye itself is entirely protected, while the eye gets a fair lookout through the slit in the wood. The ingenuity displayed by these hardy Esquimaux is very interesting and instructive.—*Frank Buckland, in "Land and Water."*

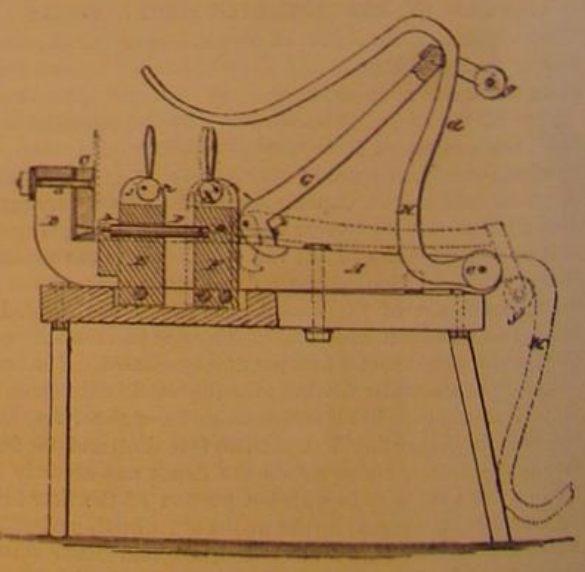
Proposed Utilization of a New York Reservoir as a Science Museum.

Messrs Vaux and Radford, architects of this city, have recently suggested the utilization of the ground on which the 42d street reservoir (which structure is no longer required for water distribution) stands as a site for a permanent museum of science. This is an old idea, which was quite fully elaborated by Professor C. F. Chandler and Mr. E. D. Lindsay some five years ago. It was then proposed to leave the reservoir as it is, removing only the inner dividing wall, the material in which could be used for building porches, etc. With the reservoir walls serving as those of the building, a glass and iron superstructure alone would be needed. Mr. Lindsay has prepared drawings of quite an imposing structure, which according to this plan would roof over nearly four acres of ground.

IMPROVED METAL PUNCHING MACHINE.

Mr. Adam Robertson, of Blanchardsville, Wis., has patented through the Scientific American Patent Agency, May 22, 1877, the novel metal punching machine herewith illustrated.

B is a right-angled support for the dies, that is formed on the end of the bed, A. C is a die that is provided with several holes for punches, and is adjustably attached to the support, B, by a bolt, *a*. D is a follower that moves in a guide, E, attached to the bed, and F is a movable block that is attached to the end of the follower and slides in the slot in the bed. The follower, D, carries a punch, *b*. G is a cam lever that is journaled in ears, *c c*, attached to the bed of the machine, and bears against the block, F. The lever, H, is curved in the form of an irregular volute from *d* to its fulcrum, *e*, and its outer end is bent into convenient form for a handle. A fork, *f*, is formed on the end of the lever, G, for supporting a friction roller, *g*, between which and the lever, G, the lever, H, passes. A loop, *i*, is attached to the block, F, and passes around the lever, G, for drawing the follower back and removing the punch from the metal. The fulcrum of the lever, H, being in the end of the bed, and that of the lever, G, being in the ears near the bed, brings the strain in nearly a straight line. The guide, E, and block, F, are provided with ears, *h*, to which fluted eccentrics, *j j*, are pivoted for clamping tire, for the purpose of upsetting it. It will be seen that as the lever, H, is brought into the position shown in the dotted lines in the drawing, the roller,

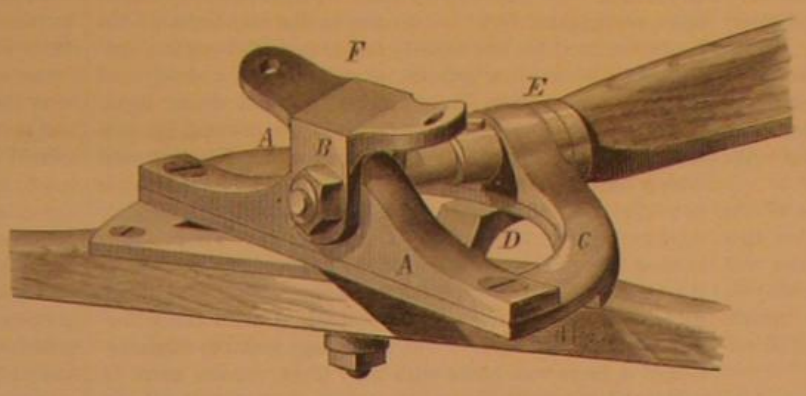


g, draws constantly nearer the fulcrum of the said lever, thereby increasing its advantage over the lever, G, which, by the form of its cam, works against the block, F, with a slightly-decreasing efficiency; but this loss is more than compensated by the advantage gained in the lever, H.

IMPROVED RUNNING GEAR FOR WAGONS.

The improved running gear illustrated herewith is so constructed that either of the wheels may rise above or sink below a level in passing over obstructions or depressions without straining the gearing or body.

The rear end of the reach is secured to the rear axle. The forward portion is rounded off, passes through the head block, A, and has a nut, B, screwed upon its forward end. Said portion of the reach also passes through an eye formed upon the upper circle, C, of the fifth wheel, the forward or straight part of which is bolted to the head block, A. The lower circle is bolted, as shown, to the forward axle. The head of the king bolt is imbedded in the lower side of the head block. The brace, D, is curved upward and rearward so as to pass beneath and serve as a guide and seat for the lower circle of the fifth wheel. Its upper end is bent upward and has an eye to receive the reach. A collar, E, on the reach rests against the forward side of the eye of the upper fifth wheel circle, to relieve the nut, B, from having to sustain all the draught. The springs of the body are attached to the saddle, F, and through lugs on the latter passes the end of the reach. The rear lug has a square hole formed through it to receive a square portion of the reach, so that the saddle is thus held parallel with the rear axle. The wagon body and gearing is thus kept from being strained or twisted by the upward or downward movement of the wheels.



ATWOOD'S RUNNING GEAR FOR WAGONS.

Patented through the Scientific American Patent Agency May 22, 1877. For further information address the inventor, Mr. Moses Atwood, New Sharon, Mahaska county, Iowa.

A Tin-Clad Catfish.

A boy, while fishing in Lake Butts des Morte the other day, felt a nibble, and, drawing his hook toward the shore, observed a half-gallon fruit can trailing on the bottom. Having secured the vessel, he was greatly surprised to find that a large catfish had taken up his abode therein and remained until his increased dimensions did not admit of egress. He had evidently flopped around in his tin parlor until a hole was made in the rust-eaten bottom, through which his tail protruded. In this condition the catfish had power to navigate from one place to another, and must have been regarded by his aquatic neighbors as a kind of iron-clad monitor.—*Menasha (Wis.) Press.*

ANGLE IRON BENDING MACHINE.

We illustrate one of several machines recently constructed by Messrs. Fielding and Platt, of Gloucester, England, for the Stephenson Boiler and Forge Company, Failsworth, Manchester. It is, says *Engineering*, adapted especially for bending angle irons for the rings of boilers 8 feet diameter, and consists of a large circular cast iron table, to one side of which the bending mechanism is attached. As will be seen from the engraving, there are one large and three small vertical rolls. The larger one revolves upon a fixed spindle, while the spindle of the others can be traversed by means of screws. The angle iron to be bent is gripped between the fixed and the middle traversing roll, and the two outer ones are then moved forward simultaneously to bend the bar to the curves required. One of the large handwheels is used for moving the griping roller, and the other for traversing the bending rolls, the screws employed for this being geared together. The two gripping rolls are driven by the gearing shown in the drawing, the moving roll being connected to the gearing by universal clutches, which allow a free motion to be given to the sliding bearings. The two bending rolls are of course free on the spindles, and are not driven. For carrying the angle irons upon the table, rollers may be recessed into its face.

Disinfecting the Air in Hot Weather.

M. Boschau has devised a method of disinfection based on the continuous and economical production of ozone by means of manganese dioxide, which in view of the present warm season, is of timely interest. Ordinary light brown wrapping paper is thinly covered with size, and on the latter the pulverized dioxide is sifted, so that it forms an adherent layer. It is merely necessary to hang the sheets thus prepared in the apartment to be disinfected or aerated. M. Boschau states that he lined a trunk with paper thus prepared, and placed therein some old cheese and strong radishes, which he left in the receptacle for a fortnight. At the end of that period the materials were removed and the lid of the trunk quickly shut. Fifteen minutes afterwards, on opening the trunk, not the slightest odor was perceptible. the ozone given off by the dioxide having completely disinfected the carbonic and butyric acids produced. The inventor proposes to manufacture wall paper, prepared in an analogous manner for use in schools, hospitals, etc.

Strange Accident.

An extraordinary accident occurred recently at a small shop in Fleet street, where American "crullers" and iced drinks are sold. Some person recommended to one of the young ladies employed in this shop the use of nitric acid and quicksilver for cleaning silver. The person thus advised purchased the prescription, telling the chemist, it is alleged, for what purpose she intended it. Whether this was so or not, negligence would seem to have been shown in giving to an inexperienced person two such dangerous agents without due warning of the consequences of their admixture. The poor girl proceeded to mix what she had obtained directly she returned to her place of occupation, with the result of a violent explosion, which, it is feared, has destroyed her sight. —*London Echo.*

Fusing Nickel and Cobalt.

M. C. Winckler announces in *Dingler's Journal* that he has succeeded in fusing nickel and cobalt in ingots of from two to five kilos, by using refractory crucibles, maintaining a very high temperature, keeping carbon and silica from contact with the melted metal, and by carefully excluding the oxygen of the atmosphere during the progress of the casting.

Oil in California.

The *Alta* says that, in Southern California, one well is already yielding 25 barrels per day, and only 180 feet depth has been bored. Pipe lines are already projected and California anticipates a repetition of the Pennsylvania oil fever.

Competitive Trials of Steam Fire Engines in Sweden.

These trials commenced near the Southwater Tower of the Government Railway Station. Shand, Mason & Co.'s engine, No. 4, which was first tested, obtained steam in 4 minutes and 30 seconds; produced 100 lbs. pressure in 7:50, and filled a tank holding 6,500 tons in the short space of 4 minutes. Merryweather's double cylinder engine produced steam in 4:30 and obtained 100 lbs. pressure in 12:10. The test of this engine in filling the tank was now interrupted, as were all other operations of the respective engines exhibited, by order of the Chief of the Fire Brigade, because of the danger apprehended of some adjacent wooden houses and sheds being ignited by the sparks ejected from the engine funnels, it blowing very hard just at that time. All the engines, eight in number, were then removed to the south side of the castle, and set to work again, in order to compete for rapidity in producing steam, equality and constancy of pressure, as well as for vertical height. The top of the staff on the roof of the castle being the highest adjacent point, and is 150 feet above the level of the water. Bedmoe's engine (Liege), which took the lead in the trial, produced steam in 8 minutes, and attained 105 lbs. pressure in 13:5. Next came an American engine (Messrs. Nichols & Co., Vermont), producing steam in 4:30 and 100 lbs. pressure in 10:30. Merryweather's single horizontal obtained steam in 7 minutes and reached 100 lbs. pressure in 10:50. Shand & Mason's large engine then produced 100 lbs. steam pressure in the shortest space of time, being 7:30 against 7:50 in the morning. Merryweather's large engine obtained this time 100 lbs. pressure in 11:40 against 12:10 in the morning. A very interesting competition now took place between Shand & Mason's and Merryweather's two largest engines. Shand & Mason used in this trial a $1\frac{5}{16}$ nozzle, and Merryweather one of $1\frac{5}{8}$ inch. The former, however, threw a higher jet, with, of course, a greater volume of water. —*Nerikes Allehanda Orebro District Journal.*

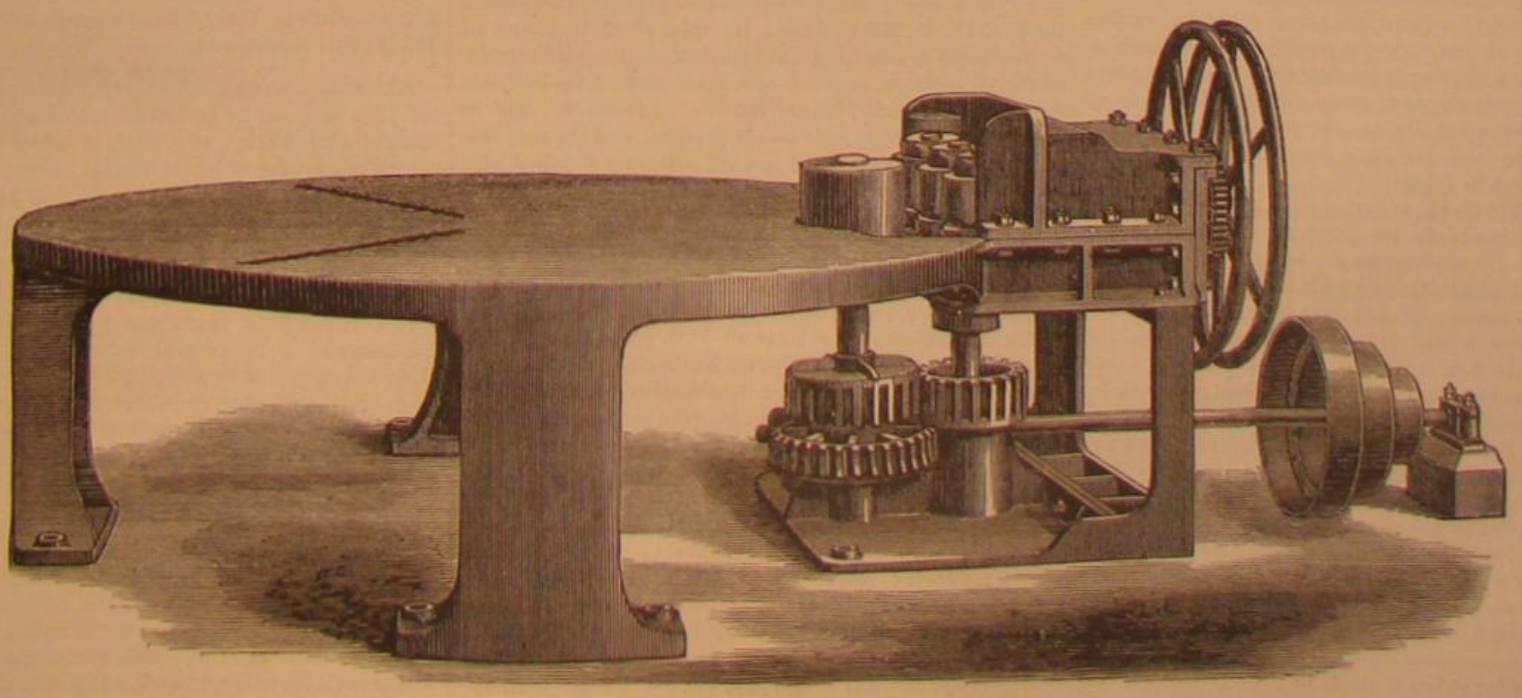
Rain Power.

A writer in *Cornhill Magazine* says that the amount of heat required to vaporize a quantity of water which would cover an area of 100 square miles to a depth of 1 inch, would be equal to the heat which would be produced by the combustion of half a million tons of coal, and that the amount of energy of which this consumption of heat would be the equivalent corresponds to that which would be required to raise a weight of upwards of 1,000 millions tons 1 mile high. To evaporate the annual rainfall on New York State alone in a year would require about five times the annual coal output of the United States.

Large Telescopes.

Clark & Son, of Cambridge, Mass., are making a telescope fifteen feet long with an object glass of eleven inches in diameter, for the Government Observatory at Lisbon, to cost $6,000, and be used for photographing the sun. Princeton College is having a $4,000 one made with a nine inch glass for astronomical excursions, and talks of getting a much larger one. The Clarks are also to make a gigantic one for Yale College, but it will take several years' work and cost some $50,000; the flint for the object glass, which has already been bought in France, cost $6,000.

IT is stated that a meteoric stone fell, on the 19th of June, at Bowling Green, Ky., within ten or fifteen feet of a little boy at work on a farm, striking a tree with a report like that of a small cannon. The report states that it weighs about a pound and a half, and resembles a fragment of grindstone, but is much harder and heavier.



ANGLE IRON BENDING MACHINE.

SCIENCE AND SCHOOLS.

We have before us an abstract of a paper entitled the "Intervention of Physicians in Education," also a set of resolutions of the New York Academy of Sciences on the subject of "Physiological Education." The author of the essay, and likewise the member of the Academy at whose instance the committee which brought in the resolutions referred to was appointed, is Dr. Edward Seguin, of this city.

In his paper Dr. Seguin advocates the active intervention of the physician in the training of children, and he thinks that such intervention should result in the establishment of open air garden schools, and also in the physician becoming the "keeper of the balance of the vital forces of the children." "Vital force" is a rather unscientific term, for as indicating a force inherent in or wholly peculiar to living matter many of our foremost thinkers have entirely abandoned it. What Dr. Seguin doubtless means is that the physician should be called upon to study the mental and physical peculiarities of children and so determine for each child its study potential —a factor belonging possibly to the class of personal equations which enter into the astronomer's labors.

In the resolutions above noted, we get a glimpse of the detail of the proposed garden school in the suggestion that the public parks of the city be devoted to that purpose, and in order that the educational facilities of the parks may be extended to adults as well, it is proposed that these breathing places be stocked with "plants of economic and scientific interest."

We quote these views both to dissent from them and to use them as a convenient example of those mistaken efforts toward scientific progress which rather retard than promote real advancement. It is indubitably true that there exists abundant room for hygienic improvement in our schools. Buildings in many cases are unsuited for their purpose, ventilation is bad, the children are too frequently kept too closely confined, and the pernicious system of requiring studies to be accomplished outside of school hours still further trenches on that period of relaxation which is necessary for the maintenance of proper health in the growing and immature body. We mean to say that there is no lack of abuses in the modern school room, and perhaps to the physicians more than to any one else, the public looks for the amelioration. Hence when physicians proceed to advocate views as little defensible as those of Dr. Seguin, the circumstance is something to be regretted.

The idea of open air schools in the abstract is well enough; but when it comes to be applied to a great city, Dr. Seguin sees no way of so doing except by taking the public parks. A child is quite competent to express its opinion on a scheme which looks to the turning of its only play ground into a school room, and it is hardly necessary to say what that opinion would be. The trouble in this, and in all large cities, is that there are not half parks enough, that the majority of children find their play ground is the filth and mire of the streets, and that the very need of more such places where a breath of air not reeking with the effluvia of a dense population can be obtained, has much to do with the large death rate which obtains among the children every summer. Dr. Seguin might have read in recent daily journals column after column of complaints because one of the least frequented parks in the city was closed an hour or two too soon in the evening, and at the same time he might have discovered that not merely to children, but to the whole working community, nothing would be more distasteful than the conversion of even the smallest park into school rooms or resorts for botanically inclined scientists.

The suggestion relative to study of children by physicians is equally impracticable. In round numbers there are about 160,000 school children in this city, and 1,550 physicians, or say one physician to every 100 children. The number of physicians in New York compared to the total population is anything below the average ratio, as to every physician there are some 700 people. From this can be inferred about the average worth of a physician's practice in this city, and the consequent cost to the people of the extra burden imposed upon the profession by critical examination of school children—supposing even that the latter could be successfully done. We do not believe it possible that any such accurate records of a shifting population of 160,000 children could be kept, especially when these children belong to all grades and conditions of life, exist under an infinite variety of circumstances, and are constantly departing as their places are supplied by others.

Dr. Seguin falls into the common error of progessive reformers, of wanting to do too much for the people and in the wrong way. No one who knows him will for an instant doubt either his philanthropy or his ability, and therefore we all the more regret any such wanderings into devious paths as the above would indicate. We cannot establish academic groves in New York just yet, nor is Young America, precocious as he is, ready to give up ball and hoop for "plants of scientific and economic interest." Urge the school boards to protect their buildings properly from fire and the consequences of panic, doctor; see that they give the children honest air to breathe, and not dilute carbonic acid; fix the studies to suit the average minds of the youngsters, and don't load them with a library of books to carry home and study nights when they should be asleep. This will be good work. We are not yet sufficiently advanced for anything beyond.

A GOOD dryer for paints is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.

Experiment with the Jablochkoff Electric Candle.

The recent experiments with the Jablochkoff electric candle at the West India docks, Limehouse, London, were completely successful. A large tent had been erected covering an oblong space of 110 feet by 80 feet, in which four ordinary lamp-posts had been set up, each having a simple spherical globe of opal glass surrounding the disk in which the kaolin and carbon candles were fixed. The electricity was generated by a steam engine of two and a half horse power. When the connecting wires were placed in circuit, the four candles flashed out a brilliantly white light that was momentarily blinding, notwithstanding the opal globes that materially veiled the intensity of the glare. For some seconds there were noticeable flashes of intermittently bright light, owing possibly to deviations in the resistance of the kaolin before it became equally fused, then the candles continued to burn for a quarter of an hour with a steady and intensely white glow, like no other artificial white light. At a distance of twenty or thirty feet from the opal lamp, it was possible to decipher the minutest notes faintly traced with a hard-pointed pencil. When sixteen gas jets with powerful reflectors were lighted, and the electric candles were extinguished, the effect was marvelous. They seemed to shed but the faintest glimmer around, and it appeared as if yellow glass had been placed in the lamps, so "jaundiced" was the sickly hue they cast in comparison with the whiteness of the other light. The next stage was the illumination of a large warehouse with only three candles burnt in ordinary lamps with rough tin reflectors, and without any opal shades to soften the light. The glow of the incandescent kaolin was in this case so fierce that the people turned away from it like owls blinded by sunlight. The illumination, however, was perfect. Except where black shadows fell, sharply defined, from interposing beams and pillars, every corner of the warehouse was penetrated by light. One gentleman had brought with him a card of patterns in different textures and every conceivable tint. Placed where the rays from one of the lamps fell directly on them, the greens, blues, yellows, reds, purples, and even the most delicate tint of straw color, were as clearly distinguishable as in daylight. After this there was an experiment intended to show the possibility of unloading ships at night. One candle was placed in a common street lamp on the wharf, and one fixed in a handlamp, with a sufficient length of insulated wire to enable it to be carried about the various parts of the ship. On deck, in the hold, and from end to end of the vessel, this lamp was borne without the light flickering for a second. Wherever it was placed, every object for yards round about was clearly defined. At the same time the light on the wharf was so powerful and widely diffused that the labor of unloading the ship might have been carried on without difficulty.

Statues to Scientific Men.

An unusual interest is manifested in France at the present in regard to honoring her distinguished men of science by erecting statues to their memory. A statue to Arago is being erected at Perpignan, in the department of Orientales Pyrenees. Another to Nicephore Niepee, a name well known in connection with improvements in photography, will be erected at Chalons-sur-Saone, his native place, by public subscription, at the instance of the Municipal Council of the city. It is also stated that a public subscription will be opened at Lyons on behalf of Ampere, the inventor of the electro-magnet, and the precursor of Faraday in the invention of the inductive electricity. Ampere was born in that city in 1775, and his father was guillotined there on the Place des Terraux for having been active in the great royalist rebellion against the Convention, which ended in the famous siege of Lyons and his capture by Dubois-Crance.

Is there a Resisting Medium in Space?

European astronomers are still wrestling with the problem. Is there a resisting medium in space? first suggested by the acceleration of Encke's Comet. Dr. Von Asten has just given the results of his investigation of eighteen passages of the comet from 1818 to 1875. He thinks that there can be no hesitation in affirming that a resisting medium is the cause of the acceleration, and that the dense part of the medium does not extend much beyond the orbit of Mercury. But in 1871, there happened to be no acceleration, and the only explanation of this Von Asten can offer is that a violent disturbance took place about the middle of June, 1869, and that this might have been caused by a collision with one of the undiscovered minor planets, whose orbits lie between Mars and Jupiter.

Exhibition of the Anthropological Society of Paris.

The Anthropological Society of Paris propose to give an exhibition in connection with the Paris Exhibition of 1878. The society has appointed a commission comprising the leading anthropologists of France, who have issued a programme which promises to be the most interesting and valuable exhibition of this kind ever displayed. The following are the classes under which the exhibition will be arranged: 1. Crania and bones, mummies and specimens relating to the comparative anatomy of the human race. 2. Instruments, methods of education. 3. Prehistoric and ethnological collections. 4. Photographs, paintings, and drawings, sculpture and modeling. 5. Geographical maps and tables relating to ethnology, prehistoric archæology, linguistic, demography, medical geography, etc. 6. Books, journals, brochures.

Danger in Vinegar.

There are more kinds of so-called vinegar in the market than brands of family flour. The New York *Tribune* thus alludes to one of them: The Board of Health of the District of Columbia has condemned five car loads of vinegar sent there from Chicago, on the ground that it is not a genuine article, and is injurious to health. An analysis of the so-called vinegar has been made. It appears, according to the report of the Board of Health, that the vinegar contains $54\frac{54}{100}$ grains per gallon of anhydrous sulphuric acid, combined with lime to form a sulphate of lime equivalent to $117\frac{36}{100}$ grains of gypsum per gallon, and besides that, 5 grains of free sulphuric acid per gallon. The Board also report that this sample was taken from an invoice of more than 1,000 barrels brought there to be sold as vinegar, and that it is likely to find a ready sale on account of its low price. The report concludes as follows: "When we think that oil of vitriol (sulphuric acid) can be bought at five cents per pound, and that a pound of said acid would render a barrel of fluid as acid as the strongest vinegar, the wonder will cease that it is sold cheap. This, therefore, is a fraud upon commerce, and a dangerous substitute for vinegar." The fraud and danger are more general than the great mass of people will readily believe. It is asserted that probably one half the vinegar sold at city groceries is a rank poison, with either sulphuric or other objectionable acids for its base, from which the acetic principle is evolved, the same as in the manufacture of aromatic vinegar or the acetates used in calico printing. Acetic acid is present in all vinegars, although they seldom contain more than five per cent of the absolute acid. Their color, flavor, and value depend materially upon the ingredients from which they are made. In England, honest vinegars are usually made of malt; in France, of grapes; in Germany, of grapes, beetroot, or potatoes; in this country, of apples and grapes.

Asparagus Paper.

A man of science, writing to the *Patrie*, explains what is the principal use to which the bundles of white stalks of asparagus, from which the tips have been bitten, may be put. They may be made into paper, and that not ordinary brown paper, or even foolscap, but letter paper of the finest description. It appears that in a few favored places there are manufactories where the asparagus ends are used in this way, and where the careful housekeeper hoards up the scraps with a diligence unknown elsewhere. But the work of collecting them is an up-hill task as yet, and it will be years before, in the natural order of things, the practice of saving them and packing them off to such factories for sale is at all generally adopted.

History of the Alphabet.

Rev. Isaac Taylor has read a paper before the Victoria Institute, London, on De Rouge's investigations of the history of the alphabet—the oldest achievement of human ingenuity. It passed through three stages—from pictures of things (ideograms) to symbols of words and syllables (phonograms) and lastly into letters. All the alphabets could be traced by means of the Moabite stone to the Egyptian hieroglyphics, and the successive changes were shown to be, in a great measure, owing to the necessities produced by the nature of the writing material, unwillingness to devote much time to the accurate reproduction of original forms, and the requirements of legibility.

Population of Russia and Turkey.

In a paper read recently by Mr. E. G. Ravenstein before the Statistical Society, London, on the populations of Russia and Turkey, he stated some facts of especial interest at present. Russia has a population of 84,584,482, while Turkey has only 25,286,868. The increase of the former is 1·1 per cent per annum, the Jews being the most prolific of the inhabitants; but in Turkey the author believes that the Turks proper do not increase at all, owing to the vicious habits of the women and the losses entailed in defending the empire. In Russia there are 100 Russians to every 50 of other nationalities, and 100 Christians to every 16 Mohammedans and pagans, while in Turkey there are only 100 Turks to every 197 of other inhabitants.

A VERY sensitive metallic thermometer on a new principle has been invented by an Italian optician in Paris. The dilations of a small sheet of platinized silver are amplified by means of a system of levers, and the motion is communicated to a needle on a dial, on which degrees are marked. The motion of the needle is almost instantaneous. The apparatus has been tested in the Ville de Paris, a new balloon sent up on June 3 at Paris.

CULTIVATE frogs, toads, and lizards. Put them in your gardens, and as the evening approaches they will hop from their hiding-places and snuggle down in some convenient spot near the gutter, or where they know their food will come plenty. The ants, roaches, mosquitoes, etc., they consume in a night is marvellous, and thus they keep down the insect pests.

THE Societies of Natural History, Geography, and Anthropology, in Madrid, have appointed a commission for the purpose of forming a Science Association, similar to those in England and the United States, to hold annual meetings in different parts of the kingdom for the investigation of scientific matters. This movement indicates a revolution in that country, more hopeful than any heretofore undertaken.

SETTING WORK AFTER CASEHARDENING.

"I make," says a correspondent, "a great many quadrants similar to the links of locomotives, and I find that the casehardening process causes the links to warp and the sliding dies to swell. How can I readjust them to a proper fit? The difficulty is that the casehardening stiffens the links, and while a certain amount of strain will open or close them, but a very little more will alter them too much. Is there any way of knowing intelligently how much strain I require in any individual case?" Our correspondent has asked a very practical and somewhat interesting question which we take pleasure in answering. In the first place, such dies always swell in hardening, and it is proper to make, during the fitting process, an allowance whose quantity must be determined by the shape and size of the die, and this experience alone can determine for each particular case. In the second place, there should be placed in slot of the link several neatly fitted pieces of sheet iron, to prevent it from closing. Then the links should be so packed in the hardening box, that the weight of the upper ones will not be likely to warp the lower ones when they are red hot. The links when taken from the box should be dipped vertically, and not thrown carelessly into the water. Notwithstanding these precautions, however, there will take place a certain amount of alteration of form, and the following method of readjusting will be found to be very efficient: If the slot is too wide, the link may be closed by iron screw clamps. If it has opened at one end only, the die should be placed in the link at the other end while the open end is closed. The closing process is very easily performed by clamping, especially when a bolt and nut is used in conjunction with the die to support the slot, in those parts that do not require closing. The closing is generally made too much, because it is less difficult to open the slot true than to close it true. The amount of opening can be more freely adjusted than that of closure, the method being as follows: Make two keys, planed on the edges to an equal taper, and of such a width that the two small ends placed edgeways together and contacting a distance about equal to twice the thickness of the link, will measure from outside edge to outside edge of the two, an amount equal to the width of the slot. The length of the keys should be about two and a half to three times the thickness of the link, and the amount of the taper should be about one half inch per foot. Take one of these keys and place it with a planed edge on the face of the slot, the key laying horizontally and projecting equally through each side of the slot, the key head being, for example, on the left hand. Take a scriber and make a mark on the face of the key, which will denote how far that end of the key projects through the slot. Take the other key and oil both of its planed edges, and insert in the slot above the other key, that is to say, so that one of its edges will contact with the edge of the key already inserted, while its other edge will meet the inside of the slot, the head of one key being on one side and the head of the other key being on the other side of the link or quadrant. Now take a hammer and drive in the key last inserted as far as the judgment, and a pair of callipers applied to the slot, indicate as sufficient to open the link to the required amount. Here, however, we may remark, that the keys being inverted, and of the same taper, the outside edges are parallel and the link is therefore being opened true, which would not be ensured were a bolt and nut used instead of the keys. Furthermore, the key that is oiled is the one that is driven. The key with the scribe mark is dry on its edge and meets the face of the slot. The result is that the driven one will drive through the slot without moving the position of the other having the scribed mark, which will keep even with the link face. Having driven in the key as directed, we take a scriber and make on the face of the driven key, and even with the face of the link, a mark which will serve to show how far the key was driven in. We may now drive the oiled key out again and test if the link slot is opened sufficiently; if not, place the first key as before, with the scribe mark even with the face of the slot, then insert the oiled key driving it a little further than before, the scribed line being a guide as to how far to drive it. Before taking it out again, we scribe a new line to indicate how far it is now driven. The keys may be removed, the testing continued, and the processes continued until completed. It will be observed that the keys thus employed, form expanding parallel pieces having the power of the wedge, and that the lines marked form a gage to work by. The gage line is especially useful, for the reason that the link will spring to a considerable degree without taking a permanent set. The keys will act just as well at the ends of the slot as in the middle, and the outside of the link may be clamped at any point not requiring to be opened.

The Ape that Most Resembles Man.

Professor Garrod lately held a reception in the Monkey House at Zoölogical Gardens, and discoursed to the people about the anthropoid apes. The professor made it plain that the anthropoids are the simial aristocracy, even if we may not more accurately call them our poor human relations. As prosector of the Zoölogical Society, the professor stated that he had dissected seventy apes out of the anthropoidal class, and one of them exhibited the vermiform appendage of the cœcum, or blind gut, which is characteristic of man. But the anthropoids have it quite humanly developed. The hands and feet of an orang recently dead were exhibited along with those of a man, and exhibited the same structure. The manners and customs of gorillas were described from authentic observations, and their domestic arrangements, their sleeping hammocks, and use of stones in cracking nuts increased the impression made that this animal is very human-like, indeed. Professor Garrod showed that the structural resemblances between the anthropoid apes and man are so close that the reason for the mental and moral differences remains still an unsolved problem. Perhaps the most striking and important portion of his discussion was that in which he proved that the vocal organs of man are present also in the anthropoid ape. The ape does not converse, and yet the difference between his vocal apparatus and that of man is so infinitesimal as to defy observation. It is to this point, however, that physiological investigation must now be particularly directed.

Professor Huxley declares that, to his mind, the only thing that promises to explain the mental difference between the anthropoid ape and man is this phenomenon of language. This he said in a lecture at the Royal College of surgeons. Language implies consultation, comparison of experience—necessarily embodies itself in the written form, becomes the storehouse of facts, results in inferences, and in the wisdom which can control and modify nature where the dumb creature is controlled and modified by nature. By the power of intelligent and purposed selection and combination so secured by the ability to talk, the animal so endowed might gradually build up a better brain on the same structure as that possessed by an animal that could not talk, and so could not obtain the complete coöperation of his fellows for the work of improvement. If it should be ultimately determined by physiologists that there is absolutely no difference between the vocal organs of the anthropoid and man, refuge would have to be taken in the hypothesis that there is some point in the animal brain corresponding to the vocal power, which does not exactly rhyme with the latter in the anthropoid, but does rhyme with it in the man.—*M. D. Conway's London Letter to the Cincinnati Commercial.*

Argentiferous Mud.

In Wasco county, Oregon, there is a flat thickly studded with springs of a peculiar character, that throw out mud, which has overflowed a considerable area. Some months ago it was reported that this mud had been discovered to be argentiferous and very rich, some specimens assaying over $2,000 to the ton. An effort was made to organize a company in this city to work the mud springs, but the enterprise collapsed in consequence of a suspicion raised that the mud had been "salted," and the memorable Arizona diamond field swindle was too fresh in recollection for the successful prosecution of another fraud in the same line. Professor Thomas Price analyzed samples submitted, and reported that he had discovered unmistakable evidence of "salting," the microscope showing filings, crystals, and free gold, which he had no hesitation in declaring had been mixed in with the mud with the manifest design of instituting a great swindle. Professor H. G. Hanks also examined specimens, but while he was inclined to suspect fraud, he was unable to determine positively whether the argentiferous mud was an artificial or natural production. Professor Hanks now intimates that the flow of the Oregon mud springs is in reality heavily impregnated with silver, and this result he announced in a paper read before the California State Geological Society. The existence of springs yielding soft mud, charged with free silver, says Professor Hanks, is new to science, and scientific men, both here and at the East, who examined specimens, pronounced them fictitious without hesitation. The specimens latterly examined by Professor Hanks, he says, were very rich, and silver was discovered in a free state. By simple washing the silver could be wholly separated, and when then examined the microscope failed to reveal the source of the precious metal. Had it been filings, a single glance would have sufficed to detect the fact. Had the silver been precipitated from solution by copper it would have been crystallized. An amalgam of silver and mercury would have yielded a sublimate if strongly heated in a glass tube closed at one end. Such an amalgam introduced into the wet mud, and the whole heated sufficiently to have volatilized the mercury, would have left the substance in a hard baked state, which could not again have been reduced to the state in which it reached this city. From these conclusions, if the silver had been introduced for fraudulent purposes, the substance was very remarkable, from the fact that some process had been employed not easily understood. Professor Hanks finally obtained the address of a gentleman, Richard Hurley, residing in the vicinity of the wonderful springs in Wasco county, and applied to him for information. In reply to Professor Hanks, Mr. Hurley writes: "There is no mistake as to this mud containing silver. I have assayed over 100 samples which contained silver, some as high as $2,300 to the ton. The samples I obtained from the spring myself. I think the weather has considerable to do with the mud containing silver. I obtain the best results when the weather is warm. Sometimes in one of the larger springs, when the weather is cold, the mud will be of a yellow color, showing no silver, but when the day is warm the mud is blackish blue, at least in places, and rich in silver. The springs seem to work more actively in a warm afternoon. Some of them contain a great deal of acid, the bones of animals that fall into them being dissolved in a few months. There are old wells which assay from $5 to $1,200 to the ton. One assay I made from the flat, half a mile from any spring, assayed $1,200 to the ton. There is a great deal of salt, almost pure, all over the spring flat. There are between 100 and 200 quartz leads discovered, running in two directions close to the spring. I find silver in several of them, all the way from a few dollars to $100 to the ton. Some of these leads run through the springs, at least they point in that direction. The altitude of this place is between 4,000 and 5,000 feet."

Professor Hanks also refers in his paper to the recent discovery of a peculiar silver-bearing deposit located in Southwestern Utah. It occurs in the "Maud Mine,' six miles from Leeds. Some assays as high as $700 per ton have been made. Instead of being sandstone, as supposed, Professor Hanks found the deposit to be sedimentary, but closely resembling the Oregon mud. Under the microscope it has all the appearance of that strange substance. The Oregon mud, if allowed to dry in large quantities, would soon form a similar substance to the Utah mineral, in appearance at least. The silver is in the state of chloride, and is seen under the microscope both amorphous and in crystals. An analysis of the two minerals will be interesting, and may throw some new light on the subject. It is possible that a study of these deposits may contribute much to our knowledge of the formation of metaliferous veins.—*San Francisco Examiner.*

Trial of a New Brake.

The express train, the "Flying Scotchman," which leaves King's Cross, London, for Newcastle, 4:05 P.M., was lately fitted up for the first time with a continuous vacuum brake. The apparatus which has been fitted on the "Flying Scotchman" is Smith's vacuum brake, the general construction of which is simple. The vacuum is obtained by a steam ejector. The steam jet is annular, 2 inches in diameter, and $\frac{1}{16}$ of an inch wide. India rubber hosepipes connect the brakes from end to end of the train with the ejector. Under each carriage is placed an apparatus variously known as a sack, an accordion, a melodion, and a bellows. It is really a canvas bag, protected by an india rubber covering, about 15 inches diameter and 18 inches long, cylindrical in cross section, fitted with iron heads, and prevented from collapsing by iron rings of round section, about ¼ inch in diameter, "cured" in the thickness of the rubber; one end or head of this bag is secured to the framing, and the other to a simple system of bars connected with the brake blocks. When the steam passes through the ejector a partial vacuum of 14 to 18 inches of mercury is formed in the bags, and they tend to collapse under the pressure of the atmosphere. But the motion is prevented, by the rings just referred to, in any direction but one, and the sacks shut up like a concertina, and in doing so apply the brakes. With the exception of the leading wheels of the engine and the wheels of the royal mail van, the train throughout was fitted with Smith's brake, each wheel having double brake blocks attached.

How Poisons are Spread.

Mr. G. Owen Rees, Consulting Physician to Guy's Hospital, London, has called public attention to some unexpected sources of arsenical poisoning. The green calico lining of bed curtains has been found to have produced, for months, severe symptoms, which were treated as those of natural disease, without benefit to the patients. When the curtains were removed the patients at once recovered their health. The beautiful pale-green muslin, largely used for ladies' dresses, has been found to contain not less than 60 grains of the arsenical compound known as Scheele's green in every square yard. He suggests that, in order to prevent much of the nausea, vomiting, headache, inflammation of the eyes, etc., from which so many suffer, there be a prohibition of the manufacture of such deleterious fabrics. Red, scarlet, and mauve-colored fabrics are not always free from arsenic. He adds that the agitation of skirts in dancing discharges arsenical poison, which probably causes some of the pallor and languor almost always wholly attributed to ill-ventilated and crowded rooms, and to bad champagne.

A Sandstorm in Rome.

June 22, a curious shower of sand and mud, coming from the south, fell in Rome, which seems to be regarded as due to sand brought in a dust-storm from the great desert in Africa, being mixed with the pollen of some vegetable, and held in solution by the cloud which carried it. An artist, writing to the *Times*, says that yellow spots, of about a twentieth of an inch in diameter, were made on the paper on which he was sketching, and also—though the color varied from yellow to white—fine drops of the same diameter fell all about the neighborhood of Rome. The cloud which brought it, though giving out little or no rain, turned the sun at 4 P. M. into the semblance of "a pale moon of greenish tint." Similar phenomena were no doubt mistaken for a rain of blood by the Romans, and regarded as prodigies, ominous of coming evil.—*Magfair.*

Carbonic Oxide in Tobacco Smoke.

M. P. Guyot calls attention in *Science pour tous* to a recent note of M. Grehaut, in which the author states that tobacco smoke contains carbonic oxide, in such quantities that a dog after being compelled by a special apparatus to smoke four cigars, was killed by the poisonous gas. M. Guyot gives a number of analyses in support of the above statement, and shows that in 100 volumes of smoke there exists ·165 volumes of carbonic oxide. If a pipe be used having a smoke chamber this proportion increases to ·18 volume, and if it has a smoke filter made of cotton impregnated with an alkali, the proportion is still further augmented to 1·695 per cent.

GRAVES' IMPROVED OIL CAN.

The invention herewith illustrated is an improved case for packing oil cans for transportation, the construction being such that the can is readily inserted, and when in place may be tilted in order to draw off its contents. Fig. 1 represents the case closed. Fig. 2 shows how the can is supported when the case closed. Fig. 2 shows how the can is being poured out. The case is made in two sections. The oil is being poured out. The case is made in two sections. The inner section, A, is attached by top cross pieces to two sides and the bottom of the can, while the outer section, B, covers the remaining sides and has a connecting second bottom. The lid, C, which has an aperture in it through which the can handle projects for convenience in carriage, and which also serves to hold the sides of the outer section firmly to the can, completes the device.

Fig 1.

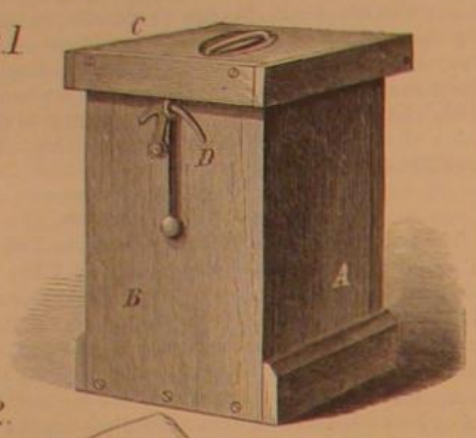
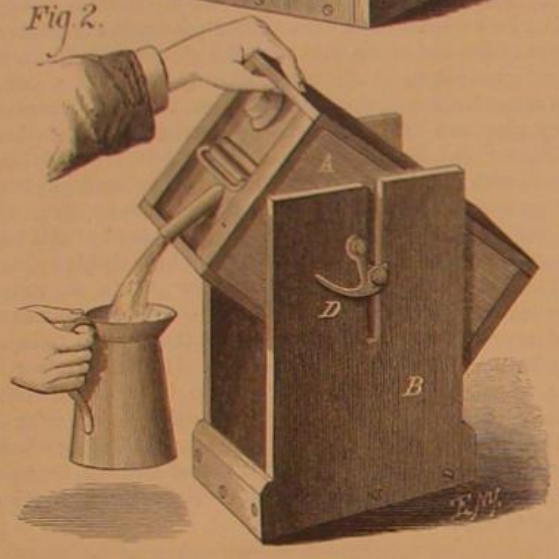


Fig 2.

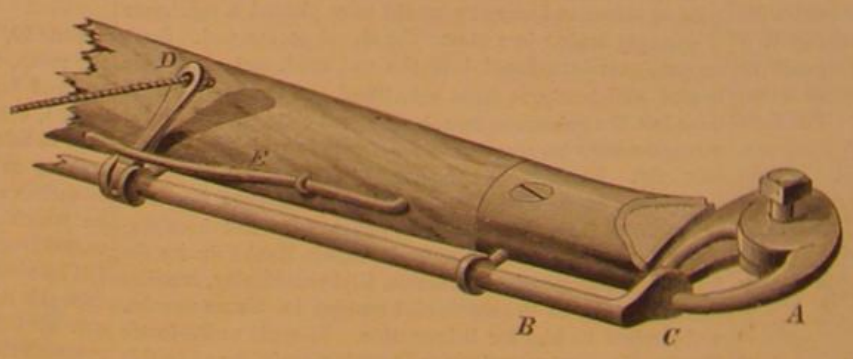


The lid is locked to the outer section, B, by means of double pivot hooks, D, passing through suitable staples, as shown in Fig. 1. Slots are made in said outer section into which enter trunnions or side pivots secured to the can. When the latter is lifted with the inner section after the lid has been removed, the hooks, D, drop, by their own weight, below the trunnions, and support the can at such a height above the bottom of the outer section that it may be easily tilted for drawing the oil from the spout.

Patented through the Scientific American Patent Agency, by John Graves, May 22, 1877. For further particulars address Frank Miller & Son, 349 and 351 West 26 street, New York city.

HORSE DETACHER.

The annexed engraving represents a novel and simple apparatus for the immediate freeing of horses from a vehicle by an occupant of the latter. Upon the ends of the whiffletree are formed lugs in which are pivoted at each end a double hook, A. The ends of this hook are at such a distance apart that the cockeye of the tug may easily be passed between them. B is a rod which works in staples along the rear side of the whiffletree. On its ends are formed heads, C, of such a size as to enter the space between the ends of the hooks, A, and so prevent the tug from slipping off. To the center of the rod is attached an arm, D, which is held down upon the whiffletree by a spring, E; to the arm a cord is attached. The cockeye of the tug is slipped over the outer arm of the hook, A, and the head of the rod, B, is turned into the space between the hooks. Should it become necessary to detach the horses, the driver pulls upon the cord, which turns the rod, and raises its head out of the space between the points of the double hook. The draught strain then turns the hook forward and pulls the tug therefrom, so detaching the horse.



BARKER'S HORSE DETACHER.

Patented through the Scientific American Patent Agency August 8, 1876. For further particulars address the inventor, Mr. Amos M. Barker, Olin, Jones county, Iowa.

Economical Paint.

Skim milk, 2 quarts; fresh slacked lime, 8 ounces; linseed oil, 6 ounces; white Burgundy pitch, 2 ounces; Spanish white, 3 pounds. The lime to be slacked in water, exposed to the air, and mixed in one fourth the milk. Dissolve the pitch in the oil and add a little at a time. Then add the rest of the milk and the Spanish white.

A Japanese Print Shop.

The shops scattered through Tokio, where cheap prints are sold, attract attention from the gay colors of the pictures, strung on the lines for public observation, and by the crowd of interested spectators generally clustered before them. The variety of these prints and their artistic merit astonish one. A prominent house, one of the largest in Tokio, has already issued one hundred and thirty sets of pictures, each comprising three engravings, on schemes suggested by the Kagoshima insurrection. The wood cutters, at the best, can earn by industry from seven to ten dollars a month; twenty-five cents a day is good average pay. To cut the more complicated plates requires from a week to ten days. The whole expense of preparing one of these prints, then, including designing, cutting the original plate and the color plates, of which latter there are sometimes upward of twenty required for one picture, inks, etc., is about seven dollars. They sell, on an average, for five cents a set of three pictures. While quite a novelty, however, they maintain a "fancy price," sometimes, where a great hit has been made, going for as much as fifteen cents a set; and, on the other hand, antiquated prints may be bought for a cent a sheet.—*Tokio Times.*

Torpedo Trial at Cleveland.

A series of experiments have been made in Cleveland, Ohio, with what is known as the "Lay Torpedo," an invention of Mr. Lay of Buffalo. The torpedo is cylindrical, with conical ends. The forward cone is calculated to contain one hundred pounds of any explosive substance. The forward section of main cylinder contains a liquid capable of powerful expansion into gas, which is used as the motive power, and is connected with the machinery by a valve operated by electricity, and a pipe. There is also a cable coiled in the same way that harpoon lines are arranged in whaling vessels, which may be any length desired, and which is connected with the shore or a vessel. The torpedo, when launched, is entirely under the control of the operator, who may be stationed on shore or aboard ship. He has a compact battery and key board on which are small switches with which he guides, controls, and explodes the craft by electricity. The secrecy with which the experiments have been made aroused general curiosity, and great crowds gathered on the dock to witness the public trial. The experiment was a splendid success in every particular. There were present a number of distinguished men, conspicuously among whom were the Assistant Chinese Minister, Yung Yuen Poo, and his secretary, a number of naval officers, and visitors from other cities. A stake boat was stationed a half mile from the shore, and when the battery was applied the torpedo started off at a rapid rate, going to the stake boat in three minutes and twenty seconds, and, gracefully rounding the boat, started on her return, which was made in the same time. It is claimed by the owners that this craft will travel twelve miles per hour. The rapidity and precision with which the machine obeyed the operator clearly demonstrated that it is one of the most formidable weapons of naval warfare ever invented.

Iron Cement.

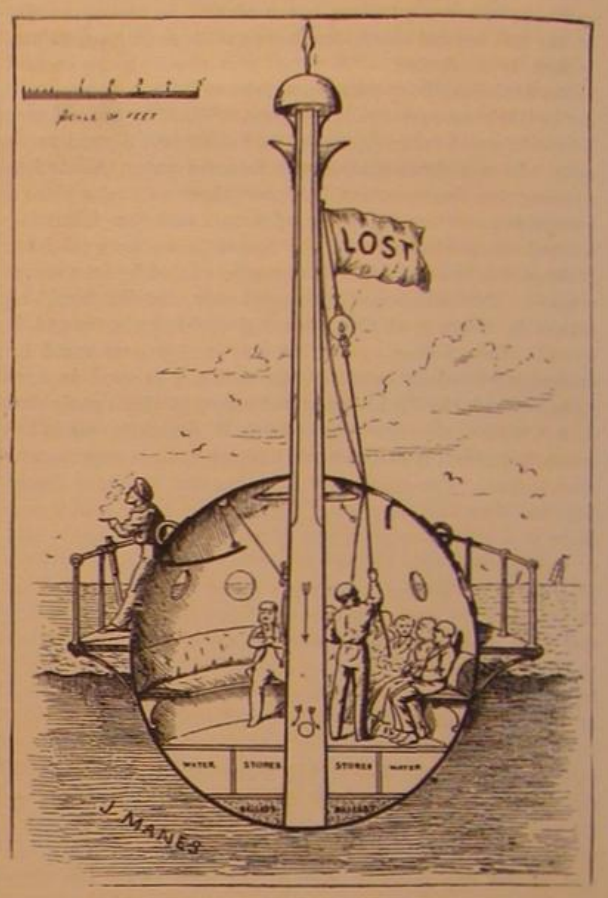
Take four or five parts by weight of dried and finely powdered brick earth, and one part of peroxide of manganese, and mix them with two parts of fine iron filings, which must be free from rust, one half part common salt, and one half part borax. Grind all fine together and mix intimately, then make into a stiff mass with water. The cement must be applied as soon as made: it is first gently warmed, and then exposed to a heat just short of whiteness. It is stated to be thus converted into a slag-like material which stands boiling water and all common heats. Another recipe is: Equal parts of finely sifted peroxide of manganese and finely triturated zinc, which are rubbed up to a thickish fluid with common water glass; this must be applied as soon as ready, and makes as hard a cement as the foregoing.—*Capital and Labor.*

Egyptian Petroleum.

It appears from the experiments of Dr. Weil that Egyptian petroleum has a specific gravity of 0·953. The Pennsylvanian and Canadian oils have a specific gravity from 0·790 to 0·830. The Egyptian variety gives a very fine lubricating oil, free of all tarry matter; but as an illuminating oil it is is inferior to American oils. It is better adapted, however, to serve as a fuel for steam generators, as it does not take fire until it attains a temperature of 135·6.

NOVEL LIFE BOAT.

We are indebted to the *Daily Graphic* for the accompanying cut of Mr. J. Manes' life boat, which seems to meet nearly every want of shipwrecked people. His boat consists of a hollow globe of metal, or wood, ballasted at the bottom, so that it will always right itself immediately on touching the water, and can never capsize even in the roughest sea. This boat has compartments for water, medical stores and provisions, bull's-eyes to let in light, a door for ingress and egress, a port-hole for hoisting signals to the mast, comfortable seats all round the inside for the passengers, and a double hollow mast for supplying fresh air, and for carrying off that which has become vitiated. On the outside of the globe boat runs a gallery, for the use of sailors in rowing, hoisting sail, discharging rockets, or steering. Of course the cases would be very rare when rowing, sailing, or steering would be required, but in case of need all three could be easily managed. A glance at the illustration will show how completely the passengers would be protected from rain and wind, and consequently, to a great extent, from cold; this is a very important point in Mr. Manes' design, as we all know that very many persons, not merely women and children, but often hardy men, only escape drowning to perish from exposure to the weather. Mr. Manes suggests that a propeller might be attached to the boat to be worked by a crank turned by the passengers on the inside. It is calculated that a boat, such as is represented in our engraving, twelve feet in diameter, would carry about fifty passengers. This boat can be carried on deck or hung over the stern on davits, in either of which positions it may be used as a cabin during the voyage.



A Vessel's Broken Shaft.

I have been down into the hold of the City of Berlin to examine the broken shaft. It is about seventy-five feet long, nineteen inches in diameter, and made of malleable iron. It broke near the middle in a diagonal split, when it was revolving fifty-eight turns a minute, and the force at the time the fracture occurred not only broke the shaft, but the journals by which the sections are attached by twelve rivets, each as thick as your arm, which were all broken short off. When I read of a steamer that has broken her shaft in the newspapers I have not paid much attention to it, but I shall hereafter.

The accident occurred under circumstances that no human foresight could prevent. It seems that the shaft in the center, where it refused to anneal, had a cavity about the size of your hand, and it was in this spot that the fracture occurred where no examination externally could detect it. This enormous shaft, after it was broken, kept whirling round, knocking to pieces such things as it hit, and had it not been for one of the engineers, who rushed into the engine room and shut off the steam, many lives would have been lost. The man has been rewarded by a handsome subscription among the passengers.—*Letter in Boston Advertiser.*

Two French astronomers, M. Andre and M. Angot, will visit California next year to observe the transit of Mercury, which occurs on May 6.

No less than five new varieties of sponges were discovered by Dr. Meyer, at the Philippine Islands and New Guinea, during his recent travels in the Eastern Archipelago.

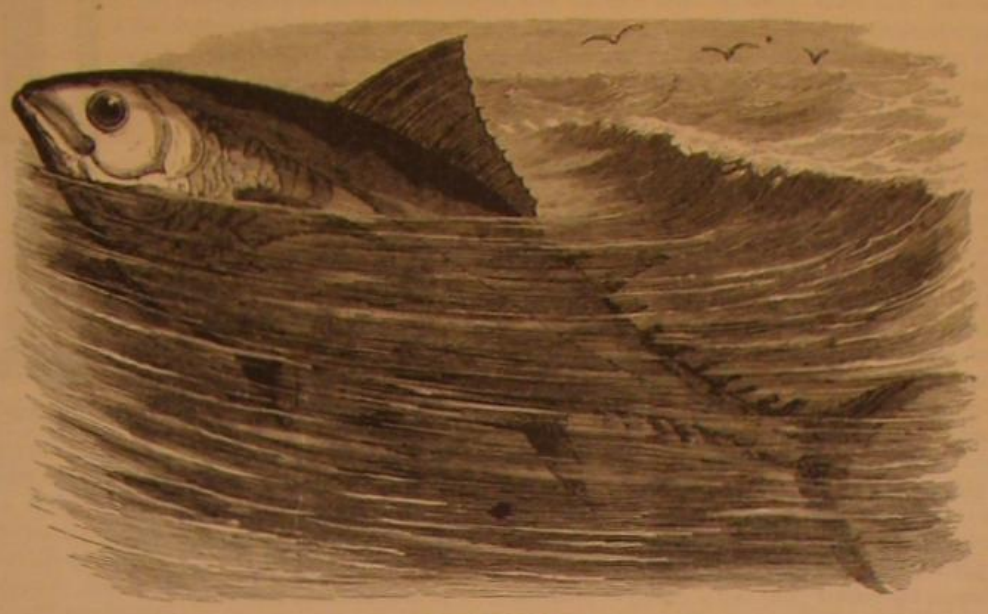
THE TUNNY.

On the shores of the Mediterranean Sea the tunny is found in great abundance, and forms one of the chief sources of wealth of the sea-side population. The flesh is highly esteemed and eaten both fresh and salted. It is extensively used in the Italian countries. It is pickled in various ways, boiled down in soups, and made into pies, which are thought to be very excellent, and possess the valuable property of remaining good for nearly two months. The different parts of the fish are called by appropriate names, and are said to resemble beef, veal, and pork.

The shape of the tunny is not unlike the mackerel, but is larger, rounder, and has a shorter snout. It belongs to the same family as the mackerel. The general average length is about four feet, but sometimes it attains a length of ten or twelve feet. One was recently caught in a mackerel net off Martha's Vineyard, and exhibited by Eugene Blackford, at Fulton market, New York city, that weighed over 700 lbs., and was fourteen feet and ten inches in length. De Kay, in his work, says that Dr. Storer mentions one that was taken near Cape Ann that weighed about 1,000 lbs. These are the largest fish caught in this country, of which we have any information.

The food of the tunny consists principally of smaller fish, although the cuttle fish forms some part of its diet. The color of the upper part of its body is very dark blue, the abdomen is white decorated with spots of a silvery luster. The sides of the head are white.

In May and June the tunnies move in vast shoals along the shores of the Mediterranean, seeking for suitable places to deposit their spawn. They are seen by sentinels, who are on the watch, and nets are prepared for their capture. These nets are of two kinds, one a common seine and the other called a "madrague," the principle of which is very much like that of the "corral," by which wild elephants are captured in India. The outer portions of the madrague intercept the fish, and on their endeavoring to retreat are forced to enter one of many chambers. They are thus driven from one chamber to another until they are forced into the last and smallest, which is significantly called the chamber of death. This chamber is furnished with a floor of net, to which are attached a series of ropes, so that by hauling on the ropes the floor is drawn up and the fish brought to the surface. They struggle fiercely for liberty, but are speedily stunned by blows from long poles, and lifted into boats.



THE TUNNY.

THE LANTERN FLY.

The curious species of firefly known as the *Fulgora Lanternaria*, or Lantern Fly, is represented in the annexed engraving. It is a large and handsome insect, with wings varied with black and yellow. The snout is long, straight, and curved upward, and the light is said to emanate from its extremity as from a lantern. It flies high and hovers about the summits of trees. Another species, the *F. candelaria*, of China, is of a greenish color varied with orange and black, with a long snout curved upward.

The causes which produce the light in the glow-worm and similar insects have been the subject of much discussion among naturalists. The most recent writers, however, agree that the luminous tissue is made up of fat globules, permeated by numerous tracheæ conveying air, with no traces of nerves or blood vessels. It does not appear satisfactorily determined whether there may not be in this tissue phosphorized fats which give forth light on contact with oxygen, hydrogen or nitrogen. The intermittence of the light is believed to depend upon the movements of respiration, and to be entirely dependent of those of the circulation. It is said that there is no heat accompanying the light, though it be a true combustion and a combination of carbon with oxygen; this may be owing to the rudeness or imperfection of our instruments, or to the slowness or peculiarity of the combustion.

THE LANTERN FLY.

Violet Ink for Rubber Stamps.

A VIOLET ink for rubber stamps is made by mixing and dissolving aniline violet 2 to 4 drachms, alcohol 15 ounces, glycerin 15 ounces. The solution is poured on the cushion and rubbed in with a brush.

An Ingenious Clock.

The firm of Messrs. Sloane & Co. have in operation a clock which, in addition to being a remarkable instrument, has an electrical attachment which renders it for the purpose it is used, that of rating chronometers, as near perfection as can be. It is not expected that the clock itself can ever come into general use, in view of the fact that it costs about $1,000, but a description of it is not on that account less interesting. It is called an astronomical clock, with mercurial compensating pendulum. Every time the pendulum vibrates, its lower point, made of platinum, passes through an insulated bulb of mercury, which alternately breaks and connects the circuit of a battery with a little sounder that taps the seconds. To this sounder is attached a little ratchet wheel with ten ratchets, and at each tap of the sounder the wheel moves one ratchet. At the tenth ratchet a platinum arm goes into a drop of mercury, making a circuit with another sounder, thus giving every tenth second a tap which, being louder than the other, is easily distinguishable. The ten-second sounder is the invention of Mr. Sloane and Commodore Dimpfel, and is now being introduced into the Naval Observatory. It enables the operator at the first rating to rate the chronometer to half a second, and at succeeding ratings to reduce the computation of the error to an infinite fraction, and by it the operator can rate chronometers almost as fast as they are put before him. The convenience lies in the fact that every tenth second being distinguishable by sound, the clock need not be watched.—*Baltimore American.*

To preserve gum solutions, a few drops of oil of cloves, alcohol, or acid will preserve a quart of the mucilage of gum arabic or gum tragacanth from turning sour. A small quantity of dissolved alum will preserve flour paste.

Military Telegraph Lines Across the Continent.

During the last two years the signal service branch of the government, under the direction of General Myer, has performed considerable work in the extension of military telegraph lines. The United States now runs and operates thirteen hundred miles of wire in Texas, and about fourteen hundred miles in Arizona and New Mexico. Recently, near Santa Fé, New Mexico, the New Mexico and Arizona systems were connected, so there is now a continuous Southern line across the continent. At Santa Fé the Western Union lines running from Denver, Colorado, into New Mexico, connect with the government wires, although the latter operate the line from Santa Fé, New Mexico, to Puebla, Colorado. It is now in contemplation to connect the Texas and New Mexico divisions by building down the Rio Grande from Mesilla, New Mexico, and El Paso to Fort Stockton, Texas, a distance of two hundred and fifty miles. The government wires in Texas connect with the Western Union line from New Orleans and Galveston. The appropriation of $50,000 for building and repairing in New Mexico and Arizona is almost exhausted, but the actual work accomplished has exceeded the Congressional estimates as to the number of miles that could be built with the sum appropriated.

Lieutenant Reade, under General Myer's direction, has built four hundred miles and rebuilt six hundred miles. The rebuilding consists in putting in new poles to take the place of inferior material, which was hastily put in some years ago. An ingenious method of utilizing the scrubby mesquit wood, in connection with soft and perishable timber like cottonwood and poplar, has been devised. The last-named woods will decay below the surface of the ground in two years' time, but when exposed to the dry atmosphere they will last a great many years. The mesquit is almost impenetrable, but its gnarled, misshapen, and dwarfed nature renders it unfit for use as a pole. In order to utilize both, the mesquit is put into the ground as a stump, and the poplar fastened to it by means of wire clasps and iron spikes.

The military telegraph line is not equal to the Western Union line in point of durability. The wire, however, is of the best class, and the general electrical apparatus is good, but the poles are lighter and shorter. As it was necessary to haul the timber for wire supports over the desert in wagons, the economy of transportation had to be studied, and the material of the country utilized. There is a rumor that the Western Union will purchase from the government the military line from San Diego to Yuma.—*San Francisco Bulletin.*

Red Mountain Iron Ore.

A letter from Birmingham, Ala., to the Louisville *Courier-Journal* says: The Red Mountain range is a solid mass of iron ore of fine quality. At one place the bank has been opened, and thousands of tons were piled up waiting to be transformed into useful articles. A company has been formed in Birmingham, and will shortly erect a furnace and rolling mill and utilize a portion of this deposit. I say a portion, for in the county in which Birmingham is situated I am told that there are twenty-five miles of the Red Mountain range which are nearly all solid ore. In this section of the State the deposits of coal and iron ore are immense enough to supply the world for ages. The question was, could the coal be used to manufacture the iron? Making iron with charcoal was too costly a process. The Eureka Company, composed mainly of Louisville and Cincinnati capitalists, undertook to solve the problem, and established a furnace at Oxmoor, and did solve it in a most satisfactory manner. The coal makes the finest sort of coke.

ON the outlet of Sterling Lakes, in the southwestern part of Orange Co., N. Y., is still in operation the iron works founded by Lord Sterling 25 years before the revolution. The first anchors ever made in America, it is believed, were forged by these ancient works in 1752. The great chain, which was stretched across the Hudson River to obstruct the passage of the British fleet, was made at Sterling Works in 1777. The chain weighed 186 tons, and was six weeks in making. It was transported in links to West Point in carts drawn by oxen. Each link weighed 150 lbs.

AN ARTIFICIAL FLOWER THAT BLOOMS.

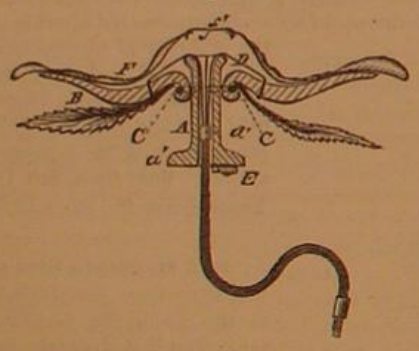
French artificial flowers are now made so closely to resemble genuine blossoms that it is difficult, save by a close inspection, to detect the imitation. In order to render the counterfeit still more complete, the present inventor has devised a flower which can be worn either as a bud or blossom, and can be folded or expanded as desired, so that it mimics the natural blooming of cut flowers.

Fig. 1.

A is a small tube, Figs. 1 and 2, of such a size that it may be readily passed through and worn in a buttonhole, and which has a flange, a', formed around its end. The other end of the tube is flared a little, and around it are placed the inner ends of four leaf-shaped arms, B. The inner ends of the arms, B, have circular hooks formed upon them to receive the rubber ring spring, C. To the arms, B, a little above their hooks, are attached the ends of threads, D, which are passed through the tube, A, and have a bead, d', attached to them in such a position that it may be within the tube, A, when the arms, B, are expanded, and when the arms, B, are drawn together, by pulling upon the threads, D, it may be at the rear end of the tube, A, so that it may be caught upon the said end, as shown in Fig. 1, to hold the arms, B, closed. By this construction, by disengaging the bead, d', from the end of the tube, A, the rubber spring, C, by drawing upon the hooks of the arms, B, will expand the said arms. If additional security is required for holding the arms, B, closed, a button, E, may be pivoted to the end of the tube, A, having a notch formed in its edge to receive the threads, D, so that by passing the button, E, between the end of the tube, A, and the bead, d', the arms, B, may be held securely in place when closed.

F, Fig. 2, are the petals, the outer parts of which are attached to the outer parts of the arms, B, which represent sepals. The inner ends of the petals, F, are connected across the end of the tube, A, by threads, f', to keep them in proper

Fig. 2.



position. When the flower is closed the petals, F, fold at a little distance from their inner ends.

Patented through the Scientific American Patent Agency May 1, 1877, by Mr. Stacy Potts, of Philadelphia, Pa.

A New Invention in Telephones.

Mr. T. A. Edison has invented a new telephone, which is thus described:

The transmitting apparatus consists simply of a long tube about two inches in diameter, having one end covered with a thin sheet brass diaphragm which is kept tight by a stretching ring. In the center of the brass diaphragm is riveted a thin disk of platina, and immediately in front of this disk is an adjustable platina-pointed screw secured to a rigid pillar.

To transmit the music it is only necessary to sing or play into the open end of this tube. This causes the diaphragm to vibrate, and the platina points, meeting, make the circuit, and the electric current transmits every vibration over the wire to the receiving end.

The receiving apparatus employed by Mr. Edison for reproducing the tones is based upon an original discovery made by him some five years ago. This discovery was that when a piece of paper moistened with certain chemical solutions is laid upon a metallic plate connected to the positive pole of a battery, and a platina-faced wire connected to the negative pole of the battery is drawn over the paper, the passage of the current through it causes all friction to disappear, and the platina-faced wire slides over the paper as iron upon ice; but if the current be interrupted, this effect instantly disappears, and the normal friction of the paper causes the wires to be drawn over it with difficulty. This principle is applied to the receiver—a resonant box, a drum or wheel having flanges on both sides. This wheel is secured to a shaft rotated by a handle. A continuous strip of paper from the reel passes over the drum, the surface of which is roughened. Resting upon the drum is a smooth platina point upon the spring, which is secured to the center of the resonant box, and presses the platina point with considerable force upon the chemically prepared paper. The current from the battery passes to the spring, to the platina point, thence through the moist paper—which in this state is a conductor—thence to the drum, and back to the battery.

The operation is as follows: When the handle is turned the paper passes forward, and the normal friction between the paper passes forward, and the normal friction between the point and the paper serves to give a forward motion to the spring; hence one side of the resonant box is drawn out. If now a wave of current passes through the paper, all friction ceases, and the spring not being pulled, the side of the resonator regains its normal position; and this takes place at each vibration. By means of this friction the most feeble currents, which would not produce the slightest effect upon an electro-magnet, thus exert extraordinary strength. This apparatus will respond and reproduce with great power the highest notes of the human voice, which are nearly inaudible when magnets are employed, the slowness of their operation being due to the time required for the magnetization and demagnetization of currents, which delay the action and mutilate the signals.

This description refers more especially to the apparatus for the transmitting of the human voice in tones or singing. The only difference between this and the speaking telegraph proper, however, is in the substitution of a plumbago point for the platina point in the adjustable screw of the transmitter. This again is another original discovery of Mr. Edison's, viz., that plumbago changes its electrical resistance with enormous rapidity under pressure, the effect in this application being that when the diaphragm is vibrated weakly contact is made with the plumbago point very lightly; and the resistance of the plumbago being but slightly reduced, a weak current is sent out from the battery, and a weak effect produced at the receiving station. When, however, a strong pressure of the diaphraghm is effected, by reason of the exercise of a more powerful vibration of the voice, the resistance is very greatly reduced, and a strong current passes to the line and a strong or loud effect is produced at the receiving station. Hence the amount of power, with all its fine gradations generated by the voice at the transmitting station, is transmitted in its proportions to the receiving instrument, and thus the fine articulation of the voice is obtained. This of itself is a wonderful invention, and will be of great value to electricians in other fields. The ability to send from a battery currents of different strength automatically is a new and valuable invention in electricity.—*Philadelphia Press.*

Balloons in War.

M. Menier, an inventor of a military hot air balloon, recently delivered in London a lecture on war time aeronautics. In conducting experiments at Woolwich, his aim has been to find a balloon which could ascend and descend rapidly for a prolonged period, could be steered, and could proceed against the wind. Rejecting hydrogen gas as an inflating medium, because it could not be generated in the air, and escaped very freely, compressed air for the same reason, and mechanical force as cumbrous and unworkable, he chose hot air, because, although it requires greater cubical capacity, the material employed for the balloon need not be specially prepared, and is therefore lighter and less liable to spontaneous combustion. By employing a special kind of fuel, the balloon can be kept up in the air for twenty or twenty-five hours, while considerable changes in the density of the air, and consequent rapid ascents and descents, are rendered easy. To his balloon, which is spherical in shape, M. Menier affixes wings all round, except in front, and a tail behind, managed by the aeronaut, acts as a rudder.—*Philadelphia Ledger.*

A New Steam Street Car.

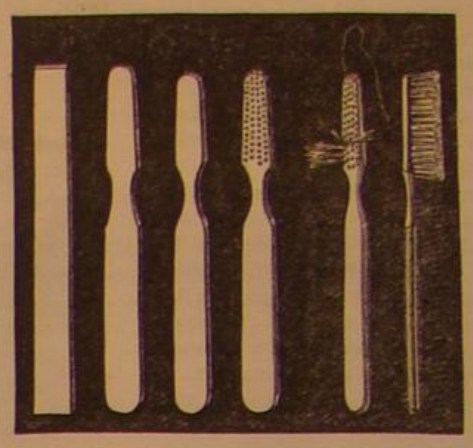
General John D. Imboden has invented a system of steam for street cars that promises to influence in a large degree the railway companies and the public in their decision as to whether steam or horse power shall be generally used for the locomotion of these conveyances. The engine is an independent sub-motor—a complete machine of itself, and can be attached to any of the present horse cars. It is simple, easily handled, cheap, and, better than all, causes no discomfort to passengers, it being out of their sight, smell, and hearing. It has its own framework, wheels, and springs, carries its coal, water, and engineer, and sustains half the weight of the car and passengers, the other half being carried by a single pair of car wheels, just in front of the rear platform. The car body is pivoted at its front end, on the engine, resting on a bed plate and springs over the boiler. The engine has four driving wheels, with a wheel base of only four feet, and, owing to the simple, pivoted connection with the car body, it is capable of curving freely. The boiler is horizontal, with simply a vertical furnace and steam dome under the driver's seat, which is outside the front of the car.

This test car has been made of the same size as that of an ordinary horse car, so as to demonstrate thoroughly that in order to convert the latter into a locomotive nothing is necessary but to take off its front wheels, put this handy little engine in their place, and nail up the front door. The interior and the rest of the car can be left intact. The new car occupies four feet less street space than one of the dummies now in use on Market street, and ten feet less than a horse car, the horses being dispensed with.—*Philadelphia Times.*

THE peculiar odor of Roquefort cheese has been found by Mr. Mencki to be due to a volatile oil of a yellow color, neutral reaction, and sharp burning taste. He separated the oil by distilling a portion of the cheese with sulphuric acid.

BRUSHES.

In making brushes by hand two different methods are pursued for inserting the bristles into the holes made for their reception in the pieces forming the backs. The workman following the first method gathers the bristles into little bunches, winds thread around their lower ends, dips these into molten pitch, and insert them into the holes with a slight rotary motion. In the second mode of procedure a loose bundle of bristles is laid with its center exactly over one of the holes, a strong cord or thin brass wire is made to enter the hole from the back, encircle the bunch, and pass



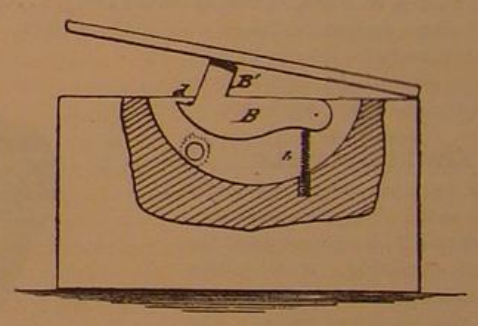
MODE OF FASTENING BRISTLES IN TOOTH BRUSHES.

out again, when on drawing it taut the bundle of bristles is broken in the middle and made to stand erect. The surface of the brush is afterwards leveled by means of a knife or other sharp cutting instrument.

Some small brushes will occasionally be met with, the backs of which, though forming but one piece, do not, however, exhibit any traces of holes or wire. These peculiar brushes are made by first drilling a series of longitudinal canals into the further end of the back, with which canals the bristle holes communicate. The wire or thread is passed through these canals, drawn out at each hole, twisted into a loop in which the bristles are laid, and finally drawn taut again. These openings in the end are afterwards filled up, previous to polishing.

A CIGAR-CUTTING CIGAR BOX.

Our engraving represents one of those ingenious little ideas which almost always prove remunerative to their originator. Plenty of devices have been suggested for cutting off the ends of cigars: some have been placed in watch charms, others in ornamental cigar stands, but no one seems hitherto to have thought of placing the cutter in the cigar box itself, as is done in the present invention.



B is the cutting knife acted upon by a spiral spring and retained in its recess by a stop pin, *d*. The knife has a handle at B'. To cut off the cigar end it is necessary only to insert the extremity in the aperture made in the box, and press down the cover which acts on the knife.

This device was patented through the Scientific American Patent Agency May 22, 1877, by Mr. A. E. Ebert, of Knoxville, Tenn.

Theory of Luminous Flames.

Experiments on the above subject are given by K Heumann, in which he finds that carbonaceous matter will give luminous or non-luminous flames, according as the temperature of the flame is high or low; diluting the gaseous combustible with indifferent gases also requires a higher temperature to cause a separation of the carbon, and thus produce luminosity. Reduction of temperature in a flame prevents either partially or entirely the formation of carbon, consequently the author thinks that the deposition of carbon on cold surfaces in a flame is not the consequence of cooling, as a deposition may be formed on red hot surfaces, but burns away in contact with air. In burners of different materials, those of iron were found to prevent the luminosity of the lower part of the flame to a greater extent than those of steatite, also when the burner is heated, a greater amount of light is produced, the consumption of the combustible remaining the same. Herr Heumann thinks that by heating the burner the luminosity is increased, and extends to a greater extent over the lower part of the flame.—*Nature.*

A GOOD whitewash for walls is made by adding to fresh slacked lime and water, a solution of starch, a little salt, and a few drops of dissolved indigo or bluing.

The Melting Point.

The theory that iron in a cupola is melted all up through the stock is wrong, for every cupola has a certain point at which the iron is melted, and there is not a pound of iron melted in any cupola until it comes down to the melting point. The melting point in a cupola is generally from six to eighteen inches above the tuyeres, but it may be raised or lowered a little by increasing or diminishing the amount of fuel in the bed: but if we get the bed too high it throws the melting point too high, and the result will be slow melting. If we get the bed too low, it will allow the iron to get below the melting point, and the result will be dull iron; and in order to do good melting in any cupola, it is very essential that the melter should know the melting point of his particular cupola. The melting point of a cupola is the point at which the most intense heat is created by the action of the blast upon the fuel. This intense heat at the melting point will cut the lining more than at any other place in the cupola, and the lining will generally be found to be cut out more just above the tuyeres than at any other point, which indicates the melting point of the cupola. If tuyeres are put in so as to distribute the blast evenly through the stock, and the charges of iron and fuel are put in evenly, and every charge leveled up properly, the heat will be even all through the cupola, and the lining will be cut out in a regular belt at the melting point all around the cupola. On the other hand, if the tuyeres are not put in so as to distribute the blast evenly through the stock, or the charges of iron and fuel are not put in even and level, or if the fire is all on one side of the cupola, the heat will not be even through the cupola, and the lining will not be cut out in a regular belt at the melting point, but will be cut full of holes, which shows that the cupola is not melting all around, but is only melting in spots. By this irregular charging and melting in spots, the cupola may be reduced to half its melting capacity, which accounts for a cupola melting fast on one day and slow on another day. As before intimated, the melting point in a cupola is the point at which most intense heat is created by the action of the blast upon the fuel. When the blast enters the cupola it is cold, and as it passes through the heated fuel it becomes hot, and as it becomes hot it creates heat by combination with the fuel, and makes an intense heat. If we have a very strong blast it will travel fast and will pass through the fuel rapidly, and it will have to pass through more fuel before it becomes heated sufficiently to make an intense heat by combination with the fuel. On the other hand, if we have a mild blast, the blast will pass through the heated fuel slowly, and is more heated, so that it does not have to pass through so much fuel before it becomes sufficiently heated to make an intense heat by combination with the fuel; so that when we have a strong blast the melting point of a cupola is higher than when we have a mild or weak blast; and the bed has to be put in higher in a cupola with a high melting point than in a cupola with a low melting point, which accounts for one cupola requiring more fuel in the bed than another cupola does. When the cupola is in blast, the bed or fuel in the bottom of the cupola is constantly burning up, and the unmelted iron will get down below the melting point. To prevent this, the melter has recourse to charges of fuel between the charges of iron, and as the charges of iron are melted and drawn out at the tap hole, the charges of fuel come down and replenish the bed and again raise the melting point; the next charge of iron comes down and is melted and drawn out; the bed is reduced and is again replenished by the next charge of fuel, and so on through the whole heat. If we supply too much or too little fuel between the charges of iron, the melting point will be raised too high or reduced too low, or in other words, if we have a melting point of ten or twelve inches in height in our cupola, and we supply twenty or twenty-five inches of fuel, this extra fuel must all be burnt up before the iron can come down to the melting point; and we will not have a continuous melting, but will have a delay between each charge of iron. If, on the other hand, we have only five or six inches of fuel between the charges of iron, when we should have ten or twelve inches, this small amount will not more than half replenish the bed, and the unmelted iron will get down too low and will not make hot iron, and the iron may not be melted at all; and in order to do either fast or economical melting, we must not use either too much or too little fuel, and we must have the fuel distributed so as to suit the particular cupola in which it is used; for, as before explained, there are scarcely two cupolas that will melt exactly alike on account of the melting point being higher or lower, which is caused by a stronger or weaker blast, or by more or less draught; and in order to do good melting, the melter should not charge his cupola just the same as some other cupola of the same size is charged because that cupola does good melting charged in that way; but he should vary the height of the bed and the amount of fuel between the charges of iron, and the amount of iron on the bed and on each charge of fuel, until he finds the exact proportions that will do the best melting in that particular cupola.

Melters, in changing from one cupola to another, will generally have trouble in making hot iron, and they will often make a complete failure of melting in a strange cupola. This is simply because they undertake to charge that cupola the same as some other cupola that they have been melting in, and they never pay any attention to the draught, blast, or the melting point of the cupola, which is the cause of their failure in melting in a strange cupola. When a melter takes charge of a strange cupola, his first object should be to study the draught of the cupola, the nature of the blast, and to ascertain the melting point of the cupola. He can generally tell where the melting point is by noticing where the lining is cut out the most, and he can tell whether the cupola is melting evenly, or is only melting in spots, by noticing whether the lining is cut out in a regular belt all around the cupola, or is only cut out in holes, as before explained. He can tell whether the bed is too high or too low by noticing how the cupola melts. He can tell whether he is using too much fuel between the charges of iron, or if he is putting in the charges of iron too heavy, by noticing whether the cupola melts regularly or not, and by noticing if it makes regular iron; for if the iron is very hot in one part of the heat and dull in another part, it is a sure indication that the fuel is not properly distributed through the iron, and it should be remedied by increasing or diminishing the weight of the charges of fuel or iron.

In melting with coke, the melter cannot put in his iron in as large charges as he can with coal, because the coke is more bulky than coal, and he has more bulk in the same weight, and if he puts the same weight of coke between the charges of iron as he does of coal, the bulk of the coke will raise the iron above the melting point, and the iron cannot be melted until part of the coke is burnt up so as to allow the iron to come down to the melting point, and the result is that he does not have continuous melting, but he has a delay between each charge of iron, and the iron will probably be dull in the latter part of each charge; but the melter can do equally as regular melting, and can do faster melting with coke than he can with coal, by putting in the coke and iron in smaller charges, and more of them, which proves conclusively that good melting can be done with almost any fuel and in any cupola, if the melter understands his business; but he may not be able to do as economical melting in a poor cupola as he can in a good one.—*From "Founding of Iron," by Edward Kirk.*

Iron-Steel.

MM. Asbeck, Osthaus, and Eicken, of Hagen, Westphalia, says the *Revue Industrielle*, have recently manufactured a metal composed partially of steel and partly of iron to which they give the name of iron-steel. The novelty of the combination consists in the introduction of a thin sheet of iron between the surfaces to be welded. A cast iron mold is divided into two compartments by means of a transverse plate or of a tube placed in the interior and the two metals are poured into the respective compartments. Before fusion both metals are submitted to complete refining which removes all matters which hinder welding. They are then turned into the mold, the sheet iron partition in which serves to prevent their mingling and to facilitate welding by being itself brought into a state of fusion. The success of the operation depends considerably on the preparation of the metals, on their readiness to weld, and on the thickness of the partition. The last is determined experimentally and the dimensions differ according to those of the ingots to be produced. The metal thus prepared is said to be adapted for the fabrication of rails, anchors, and armor plates, etc., where the hardness of the steel diminishes the wear and increases the resistance of the masses. In the construction of safes, plates of this combination are said to be proof against attempts to break or drill through them. In all portions of machines or for tools which support or transmit heavy pressure or undergo instantaneous and powerful stress, as in rolls or axles the metal is claimed to possess very superior advantages.

Gas Main Leakage.

There appears to be a good opportunity for some one to invent a cheap method of rendering the pipes and mains which conduct illuminating gas under city streets thoroughly tight. At the present time there is always leakage, and when the earth is broken to reach water pipes, etc., in our thoroughfares, the overpowering stench shows the ground air to be thoroughly permeated with gas. Even if this, as Dr. Chandler says, is not directly detrimental to health is at least exceedingly disagreeable, and without doubt it exhales from the ground in sufficient amounts to add its quota to the combined odors of garbage and refuse which pervade the densely populated districts of the city. The principal parties affected by leaky gas mains are the gas companies, and we are informed that the yearly loss from this cause reaches considerable figures. Gas pipes are tested by closing the ends, plunging them in water and pumping in air, the escape of which indicates the existence of flaws. If these are large the pipe is rejected, if small they are closed by hammering; but that this system does not entirely guard against leakage, is, as already stated, evident. Coal tar has been used as a varnish for outsides of pipes with fair results; but cannot the metal of the pipe itself be so mechanically treated, by compression or rolling either outside or inside, that it shall be wholly impervious to gas?

Self-Vivisection.

It is not often that an inventor has such an implicit faith in his invention, or the nerve to demonstrate the fact as Dr. Waters, of Salem, recently showed before the Massachusetts Dental Society. He stated that bicarbonate of soda, such as used for cooking purposes, or any other alkali in neutral form, would afford instantaneous cessation of pain from the severest burns and scalds, and would cure such injuries in a few hours. Deliberately dipping a sponge into boiling water, the Doctor squeezed it over his right wrist, producing a severe scald around his arm and some two inches in width. Then, despite the suffering occasioned, he applied the scalding water to his wrist for half a minute. Bicarbonate of soda was at once dusted over the surface, a wet cloth applied, and the pain, the experimenter stated, was almost instantly deadened. Although the flesh on the wrist was literally cooked down to the sweatglands, and the wound was of a nature to be open and painful for a considerable time, on the day following the single application of the soda, the less injured portion was practically healed, only a slight discoloration of the flesh being perceptible. The severer wound in a few days, with no other treatment than a wet cloth kept over it, showed every sign of rapid healing.

Purification of Bismuth.

Bismuth has been purified by Mr. E. Smith in this way: To every sixteen parts of bismuth, kept in a fluid state, at the lowest point of its fusing temperature, he added one part of a mixture composed of three parts of flowers of sulphur and eight parts of cyanide of potassium. The bismuth was kept melted for fifteen minutes after the mixture was introduced, and then allowed to cool.

NEW BOOKS AND PUBLICATIONS.

STRENGTH AND DETERMINATION OF THE DIMENSIONS OF STRUCTURES OF IRON AND STEEL. By Dr. J. J. Weyrauch. Translated by A. Jay DuBois, Ph.D. New York: John Wiley & Sons, 15 Astor Place.

Dr. Dubois' translation of Dr. Weyrauchs' work will especially commend itself to engineers as being prepared at the especial request of the author, and as it consequently is the only one vouched for by Dr. Weyrauch, its accuracy and authenticity need no better recommendation. As to the value of the book, it will be sufficient to say that its object is to substitute the legitimate deductions of varied and careful experiment for abstract and purely theoretical assumption; to furnish in lieu of arbitrary rules accurate and reliable formulæ involving all the necessary data for a simple and rational method of dimensioning in a systematic manner covering all cases. "What has for the last hundred years justified the assumption that a piece which has once successfully resisted a certain stress, must necessarily resist equally well an independent number of repetitions of that stress? How can it be held that it is a matter of indifference whether a piece is subjected always to the same constant load, or is alternately loaded and then unloaded, or is even subjected to alternate strains of tension and compression. * * * By assuming the strength which is not constant, as nevertheless constant for every member of a construction, the degree of safety of the different members varies. The least safety of any place in the structure is however the measure of the security of the whole. If one member gives way, it is a matter of little moment whether in falling, the other members hang together or not." This extract from the translator's preface will give the key to the tendency of the work. In order to determine the required area of cross section of a part to safely resist a given stress the practice has been to divide the greatest stress by the assumed allowable stress per unit of area and the resulting general value is taken as invariable no matter whether the stress be occasioned by dead load or whether it undergoes sudden changes. After a long series of experiments Wohler reached the conclusion that "rupture may be caused not only by a steady load which exceeds the carrying strength, but also by the repeated application of stresses none of which are equal to this carrying strength. The differences of these stresses are measures of the disturbance of the continuity, in so far as by their increase the minimum stress which is still necessary for rupture diminishes." Starting from Wohler's law which does not cover all cases, Dr. Weyrauch reviews and adopts Launhardt's formula which he shows to be applicable when a piece is always extended or always compressed or generally submitted to stress of a single kind. In the succeeding chapter (chap. IV) the author himself deduces a formula, instances of pieces subjected to alternate tension and compression. The subject matter of the remainder of the volume is of a directly practical nature. Chapter V deals with carrying strength for compression and tension, and embodies the results of a host of valuable experiments. Then follow sections on transgression of elastic limit, annealing, tempering, influence of form, constituents of steel and iron, influence of temperature, estimation of material, allowable stress per square centimeter, method of determining dimensions, shearing strength and rivetting, the last very fully discussed. The book ends with an appendix in which other methods are considered, and Professor Thurston adds his excellent papers on strain diagrams with which our readers are already in some measure familiar. There are several good illustrative plates, some valuable reduction tables, and in general as the translator claims the subject is capitally set forth "in a shape to meet the daily wants of the practising engineer and constructor."

A PRACTICAL TREATISE ON LIGHTNING PROTECTION. By Henry W. Spang. With Illustrations. Philadelphia: Claxton, Remsen, & Haffelfinger, 1877.

This little treatise contains quite an amount of interesting practical information on the subject of lightning and the means to be employed for securing immmunity against its effects. Its main object seems to be however to introduce to public notice a new mode of obtaining a proper ground connection, which if capable of performing all that it is claimed for it can hardly fail to meet with extended favor. It strongly recommends the old but excellent idea of making all large masses of metal about a building, such as metallic roofs, rain and gas pipes, etc., serve as lightning conductors, and shows that they will afford absolute protection if connected properly with the earth. Explicit directions are given for ensuring the safety of structures of all kinds, also of ships, oil tanks, telegraph poles, wooden bridges, steam boilers, etc. The work will be found useful in many respects and will no doubt be fully appreciated by all who may have occasion to consult it.

THE FOUNDING OF METALS. A Practical Treatise on the on the Melting of Iron. By Edward Kirk. Price $2. Published by the Author, Albany, N. Y.

A capital little work written by one, who as every page indicates, is practically familiar with the subjects treated. The volume contains numberless suggestions of a type not found in ordinary treatises on metallurgy, and in brief it belongs to that class of books which intelligent workmen might often prepare regarding their trades, and of which there can never be a superabundance. The work is comprised under the three general heads; iron, founding of alloys and minerals, and gases, and each topic is fully discussed in a series of short pointed chapters. The author writes in a pleasantly readable way, altogether different from the style of the ordinary technical treatise. We can commend the book, as well worth careful perusal by both employers and workmen in the metal industries.

NARRATIVE OF THE POLARIS EXPEDITION. Edited by Rear Admiral C. H., Davis, U. S. N. Washington, Government Printing Office.

As its title indicates this large and finely illustrated volume gives a complete history of the North Polar Expedition which set out in 1871 in the steamer Polaris under command of Captain Charles F. Hall, and which virtually terminated or rather failed with the death of that brave explorer. The voyage of a portion of the survivors of the crew, detached from their vessel and afloat on an ice floe has already passed into history as one of the most wonderful of escapes from apparently certain destruction. The late Admiral Davis entered enthusiastically into the labor of condensing all the journals, reports and narratives of the officers and crew of the Polaris into one connected recital of events. This has been produced in a manner which merits the highest praise. Admirably and graphically written, lavishly embellished with illustrations from photographs, the volume is one which, unlike most emanations of the Government press may be read with profit and interest from beginning to end.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW AGRICULTURAL INVENTIONS.

IMPROVED BARBED FENCE.

Lyman P. Judson, East New Market, Md.—In this invention a strip of any suitable metal has perforations made at such intervals as may be desirable. In these perforations wire barbs are placed, and, by means of suitable tools, are bent down parallel to the sides of the strip for a small portion of their length, and then are bent outward at right angles to the strip. The wire barb is clasped upon the sides of the strip loosely, so that it will yield sufficiently to not tear the flesh of an animal, or draw wool from sheep.

IMPROVED ANIMAL TRAP.

Edgar B. Beach, West Meriden, Conn.—This invention is an effective trap for catching animals by killing the same at the moment when they try to take the bait; and it consists of a piston at the end of a pivot arm propelled in a circle by the discharge of a gun barrel, as soon as the spring-acted hammer of the same is released by nibbling at the bait.

IMPROVED FRUIT DRYER.

William M. Eddelman, Wahoo, Neb.—This invention is an improved fruit dryer of simple and cheap construction, that may be used on any stove or furnace without danger of smoking, burning, or charring the fruit. It consists of a double pan having a bottom receptacle filled with water by a funnel-shaped spout, that is surrounded by a dishing plate to catch any water forced out by the steam. The pan is of flat shape, and has a double bottom that forms a receptacle for water and steam below the bottom of the drying pan. The water is filled into the receptacle by a funnel-shaped corner spout, with outward inclination, through which the steam formed in the receptacle may escape. The heat produced by the generation of steam in the receptacle is claimed to dry the fruit in a superior manner, without exposing the same in the least to the danger of being burned or charred, or of obtaining a smoky taste.

IMPROVED FEED RACK.

William H. Howard, Albany, Wis., assignor to himself, J. F. Tracy, and Jonathan H. Roberts, of same place.—This is an improvement in the class of devices for feeding stock in which the supply is regulated by sliding or swinging valves. It relates to the specific construction and arrangement of valves with reference to the hopper and feed trough proper. A hopper contains grain or other feed, in the bottom of which hopper holes are made through which grain may pass to the boxes that are placed below the hopper in the trough upon each side of a central partition. Slides or valves are placed in the bottom of the hopper and in them holes are made, which correspond with the holes in the bottom of the hopper. These slides are capable of being moved by levers, so as to open or close the holes in the bottom of the hopper. Crossbars extend across the hopper above the slides, and serve the double purpose of keeping the slides in their places and of stirring the grain when the slides are moved.

IMPROVED HOG CATCHER.

James H. Eames, Emerson, Iowa.—This is an improved device for catching hogs, sheep, calves, and other small animals, and poultry, which holds the animal securely. It consists in the combination of the pivoted curved jaws, provided with shanks of different lengths, the curved bar, provided with a socket to receive the handle, the jointed bar, the sliding cross or T head tripbar, the spring, and the cord or strap with each other. The jaws are curved inward or toward each other, and the ends of which overlap each other. The jaws cross and are pivoted to each other, and are widened at their point of crossing to give them a wide bearing, to keep them from turning or getting out of line with each other. The shanks of the jaws are made of different lengths, and to the longer shank and its jaw are attached the ends of a curved bar, to which is attached a socket to receive the handle. The handle, for ordinary purposes, should be about ten feet long.

IMPROVED BEEHIVE.

Charles J. Sperry and Lyman Chandler, New London, Minn.—The object of this invention is to improve the construction of the beehive for which letters patent No. 143,307 were granted to the same inventors September 30, 1873, so as to make it more convenient in use, enabling the bees to be more readily handled and controlled. The bottom of the hive, the lower side of the forward edge of which rests upon the table, is supported in an inclined position by legs attached to the back of the hive, to the lower edge of which the bottom is attached, and which is vertical, or nearly so. The front of the hive, the upper part of which inclines outward, is attached at the lower edge to the bottom, at a little distance from its edge. The projecting part of the bottom serves as a table for the bees to alight upon. In the middle part of the lower edge of the front is formed a long notch for the ingress and egress of the bees. The size of this passage is regulated by a slide placed in a groove in the lower edge of the front, and which is supported adjustably by two wedges placed beneath it at the ends of said notch. By this arrangement, by adjusting the wedges, the slide may be raised to permit workers and drones to pass in and out, or lowered to shut out the drones, while allowing the workers to pass in and out freely.

IMPROVED HAY DERRICK AND STACKER.

Richard N. B. Kirkham, Kansas, Ill.—This invention is an improved machine for elevating hay in stacking it in the field, which enables the hay to be raised upon the stack faster, and with less labor of man and horse, than is possible with the machines for this purpose now in use. It consists in the combination of the inclined circular track and its supporting framework, the circular plate and its pivoting shaft, the two parallel semicircular plates, and the two levers and their wheels with each other; and in the combination of the curved drawrod or sweep and its brace with the circular plate, and the two parallel semicircular plates, the two levers, and their wheels.

IMPROVED METALLIC FENCE CAP.

John D. W. Lauckhardt, Brooklyn, N. Y.—This improved fence cap serves the threefold purpose of a weather protector, an ornamental covering, and of a guard against the inroads of cats and boys; and it consists of a sheet or cast metal cap with tapering sides and spurred top.

IMPROVED IRON POST FOR WIRE FENCES.

John Plane, Belvidere, Ill.—The post is made of angle iron of any desired length and size, as circumstances may require. In one or both edges of the post are formed inclined notches to receive the wires. The wire is secured in the notches by buttons pivoted to the posts in such positions that they may be turned down upon said wire.

IMPROVED HAND SEED PLANTER.

Francis B. Preston, Fayette, Mo.—By suitable construction, as the slide is raised enough seed for a hill is taken from said hopper and dropped into the slot of the board, down which it passes and rests in the angle between plates. Whe the planter has been thrust into the soil the slide is pushed down, which forces one plate back and forms a space in the soil into which the seed drops. The seed is covered by the falling in of the soil as the planter is raised.

IMPROVED SLED BRAKE.

Ephraim M. Lawrence, Bryant's Pond, Me.—This is an improved brake for sleds, so constructed that the operation of holding back will apply the brake, and the operation of drawing will raise the said brake, and the device may be readily fastened to allow the sled to be backed without applying the brake.

IMPROVED FENCE.

James Garrett, Pembroke, N. Y.—This invention consists of two upright pieces, that are secured to a base block by a fastening wire passed around the block and attached by eyes to the upright. The latter carry the rails or intermediate blocks, and are rigidly secured to the ground by a lateral brace wire secured to and keyed by stakes into the ground.

IMPROVED GRAIN SCOURER.

James S. Hillyer, Rockford, Minn.—This grain scourer consists of an inclined revolving cylinder, the inner face of which is longitudinally corrugated and covered with a coating of emery.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED STONE DRILLING MACHINE.

Ferdinand Johnson, Toledo, O.—This is an improved drill for boring holes in rocks for blasting and other purposes. It consists of a connected cylinder and drill, that are lifted jointly by revolving cams, and rotated at the same time by suitable pawl and ratchet mechanism, operated by a pitman and pawl connection with a trap block, ratchet, and rack of a slotted sleeve, through which the cam shaft and lifting roller shaft pass. The drill shaft is vertically adjustable to any depth, and guided by rollers of the bed frame, the drill being readily moved from place to place by a truck under the bed frame.

IMPROVED GRINDSTONE SHARPENING ATTACHMENT.

Henry F. Bush and Martin L. Bush, Douglassville, Pa.—This invention is designed to provide for common grindstones an improved attachment by which the knives of moving machines may be sharpened in rapid and superior manner, two edges of adjoining knife sections being ground by one stone at one and the same time. It consists of a second grindstone of V diamond shape, that is hung in a suitable frame, centered to the shaft of the main grindstone, and revolved by belt and pulley connection with the same. The knife of the mowing machine is clamped on a base plate and reciprocated toward the oscillating grindstone by suitable mechanism.

IMPROVED FRUIT PARING, CORING, AND STONING MACHINE.

George Bergner, Washington, Mo.—This invention relates to such improvements on the apple parer, corer, and slicer for which letters patent were heretofore granted to the same inventor under date of January 9, 1872, and numbered 122,553, that the same may be used either for paring, slicing, and stoning or coring peaches or apples, or for the purpose of paring the fruit merely, as required. It consists of a recessed spring fork, that is revolved by a hand crank, in connection with a swinging and spring-acted paring knife, which is operated by a rack rod and gear, and automatically thrown in or out of motion by a worm thread of the fork rod, and a spring-acted rod holder. The fork rod holder is acted upon, respectively by a hook at the end of the sliding rack rod, or by a fixed lug of the revolving fork rod, and retained in or out of gear with the worm by suitable locking devices. A longitudinally sliding and sidewise swinging slicing knife is guided along the base frame and pushed forward for slicing and stoning the fruit. A swinging and spring-acted arm is attached to a short post of the rack rod, and engaged by a fixed lug or pin of the base frame of the apparatus, to throw the fruit off the fork when it is not desired to slice the same.

IMPROVED MACHINE FOR CUTTING SCREW THREADS.

Louis Bollmann, Vienna, Austria.—This invention relates to machinery for cutting screw threads. It may be applied for cutting regular or irregular forms, besides screw threads, the work receiving always a shape which is an exact counterpart of the acting surface of the cutter. Two or more screws of different pitch, besides any complicated form, can be cut at the same time. To give to the cutter the exact shape required an exact copy of the work is used, and by cutting into it, the teeth make a cutter out of it, which is then hardened. This cutter is then fastened to the lathe spindle in place of the work, while the unhardened cutter which is to be made is fastened on the cutter spindle. By bringing, now, both cutters in contact, the soft cutter will become an exact copy of the form required.

IMPROVED CAR COUPLING.

David R. Halter, Lee's Cross Roads, Pa.—This invention consists of a drawhead having hinged, spring-acted, and adjustable coupling link, in connection with a drawhead having a pivoted and weighted draw lever and a laterally sliding coupling and uncoupling pin.

IMPROVED ROLL FOR REDUCING TUBES.

William McKenzie, New York city.—The object is to reduce the size of tubing by drawing it between loose rollers while hot. The device consists in the arrangement of one or more pair of rollers in a hinged frame, which is capable of adjusting itself so that the distance between the rollers may be varied to accommodate pipes of different sizes.

IMPROVED ORE STAMP.

Thomas Schofield, Grass Valley, Cal.—This consists in the combination of a ring supported and guided by rollers, and carrying a number of cams, and a number of stamp rods having collars that are engaged by the cams as the ring revolves. The device is a portable and efficient quartz battery, which may be worked by horses or other animals, and by them be drawn from place to place.

IMPROVED CAR STARTER.

Andrew J. Curtis, Monroe, Me.—This is an improved device for attachment to street cars, so constructed as to enable the momentum of the car to be used for stopping it, and the same power to be applied for starting it. It is simple in construction and conveniently operated.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED CARRIAGE BODY ADJUSTER.

Isaac Wilkins, Jr., Greenpoint, N. Y.—This invention relates to an improvement in carriage bodies whereby the door frame may be quickly and easily adjusted when the body sags so as to bind the door in the door frame.

IMPROVED DOOR BOLT.

Alpheus A. Dennett, New Britain, Conn.—This invention consists in the combination, with a sliding bolt, of a thumb piece having a crossbar, which, when the bolt is either retracted or projected, is capable of locking said bolt. To this end the crossbar of the thumb piece is turned at right angles to a slot of the guide casing of the bolt.

IMPROVED WAGON SEAT LOCK.

Charles E. Stone, Salisbury Mills, Mass.—The advantage claimed for this improvement is, that the seat may be readily moved from one position to another on the wagon body, and may be securely clamped. The device is a wagon seat lock provided with the beveled nib on the lower end of a swiveled plate, the same being arranged to enter a groove in the side board and catch under an iron strip.

IMPROVED LATHE FOR CUTTING SCREW TAPS.

George R. Stetson, New Bedford, Mass., assignor to himself and Morse Twist Drill Company, of same place.—This relates to improvements in machines for cutting taps or other forms, where a longitudinal slot or depression relieves the tool from work during a portion of the time of its revolution, so that when the cutting tool passes over the longitudinal slot or depression the motion of the blank being cut is more rapid than during the time the tool or cutter is at work.

IMPROVED ROOFING TILE.

Philip Pointon, Baltimore, Md.—The improvements embodied in this invention are designed principally to prevent the warping and twisting of the tile during the baking operation when arranged horizontally in vertical piles. The improvements consist in the peculiar formation of upper and lower lips on opposite faces and ends of the tile, which serve to couple the tile on the roof and yet permit them to be arranged parallel in the kiln. It also consists in extending the upper and lower lips past each so as to support the tile at the corners, and also in forming a raised ornamental figure in the center which supports the tile in the center during the operation of baking. A further improvement consists in forming the tile with a beveled face upon the lower side in order to strengthen the tile when laid upon the roof.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED HOOK FOR HARNESS.

Richard Lowell, Flushing, N. Y.—This is an improved water hook so constructed as to prevent the check from coming off the hook accidentally, and which will not prevent the check from being put on and taken off with facility. It consists in the combination of the U-shaped keeper with the neck formed upon the water hook at its bend. The body of the water hook, which may be of any of the ordinary shapes, is bolted to the saddletree in the usual way. Upon the forward part of the bend of the hook is formed a neck, around which the check passes. A U-shaped keeper, which is bent to correspond with the bend of the hook, has the arms which fit into recesses formed in the sides of the hook. The arms of the keeper are pivoted to the opposite sides of the hook at the lower part of its bend, so that it may be swung forward. In checking the horse, the keeper is swung forward, the loop of the check is put through it, and passed over the point of the hook, and the movement of the horse's head will draw it into place. In unchecking the horse, the loop of the check is drawn back and passed up over the point of the hook, and the movement of the horse's head will draw it out through the keeper.

IMPROVED MEDICINE CASE.

Jerome Millard, Pultneyville, N. Y.—This is a convenient and compact case for the use of physicians for carrying remedies. A box of suitable dimensions has a middle partition and covers at each side, that are hinged to the body of the box. The space on one side of the partition is divided longitudinally by a partition, and the space at one side of this partition is subdivided into smaller spaces for receiving bottles by the partitions, the space at the outer side being filled with small phials placed in removable pockets. A number of pockets are formed for receiving the phials, and a tray having pockets for receiving phials is fitted to the box above or outside of the pockets. The entire interior surface of the box and covers is covered with felt, velvet, or other soft or yielding material. The handle of the box consists of an oblong ring, which is pivoted in ears that are attached to the box by means of screws. The case is arranged to accommodate phials of different sizes, and is constructed so that every compartment may be readily opened. The whole forms a compact and convenient case for containing a number of remedies.

IMPROVED PULP ENGINE.

Edwin Sumner, Baldwinsville, Mass.—This improvement consists in arranging within the roll cover or hood of a paper pulp engine an inclined chute that receives the pulp thrown up by the roll, and carries it transversely toward the cutside of the curb, the object being to equalize the velocity of the circulation of the pulp in the curb, so that a homogeneous mass of paper pulp is produced.

IMPROVED PYROTECHNIC SIGNAL CARTRIDGE.

Jacob J. Detwiller, Jersey City, N. J.—This consists mainly in a cartridge having the usual percussion priming, and containing a propelling charge of gunpowder, a perforated wad, and a cylinder or ball of highly combustible composition, capable of giving out a red or white light when burned, and a closing wad, which completes the cartridge. It also consists in forming, on the percussion end of the cartridge, one or more projections, by which the color of the cartridge may be determined in the dark.

NEW HOUSEHOLD INVENTIONS.

IMPROVED CHAIR BRACE.

James W. Collins, Laramie City, Wyoming Territory.—This is a brace to be attached to an ordinary chair, to strengthen and stiffen it, and to draw its joints firmly together. It consists of a crosspiece attached to the under side of a chair bottom, and provided with sockets for receiving the upper ends of braces that incline downward and outward, and are attached to the legs of the chair near their lower extremities.

IMPROVED MILK COOLER.

Rollen C. Greene, Potsdam, N. Y., assignor to himself and Nathan P. Chaney, of same place.—This milk pan is so constructed as to enable the milk while in the pan to be cooled or warmed, as may be required. There is a top tank, a surrounding air chamber, and a bottom tank.

IMPROVED COFFEE ROASTER.

George W. Tinsley and Amandes Hackman, Blakesburg, Iowa.—This relates to an improved coffee roaster, by which the flavor of the coffee is fully retained, and the same roasted in convenient manner without interfering with the cooking operation of the stove. The invention consists of a drum with end pipes connecting with the stove opening and the chimney pipe, the drum having an interior heating cylinder with detachable heads, in which a revolving wire cloth cylinder is supported.

IMPROVED VAPOR BATH.

George W. Walker, Guy's Mills, Pa.—This consists of a boiler or vapor generator formed within a metallic cylinder, the lower portion of which is perforated and forms a receptacle for a lamp, while the upper portion is provided with a single row of perforations for distributing the vapor that issues from the central aperture of the boiler top.

IMPROVED GAS REGULATOR.

Samuel S. Jones, Norristown, Pa.—This device is so constructed that the consumption of gas may be economized, and, if desired, entirely interrupted at any one burner. It consists of a burner socket or base, with exterior threaded issuing tube and slotted cap or valve adjustable thereon. The valve is inclosed by a bulb-shaped outer part, to which the burner is attached.

IMPROVED STOVEPIPE DRUM.

Jacob Closs, Decatur, Ind.—The construction is such that no ashes can collect in the drum as they must fall through the heads, forming a part of the drum and back into the stove through the stovepipe. The advantages claimed are its efficiency in utilizing the greatest possible amount of heat, in controlling the draft, freedom from choking or clogging, and the facility with which the drum may be taken apart for cleaning or repairs.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

Notes & Queries

C. H. B. is referred to reply to W. G. F. (No. 25) in No. 3 present volume. About etching, see reply to C. H. B.—I. F. R. asks for a recipe for a depilatory, and is referred to Cooley's "Cyclopedia of Practical Receipts," p. 400.—W. H. T. had better correspond with some of the officers of the expedition to which he refers.—C. C. N.—For directions for preserving insects write to the Smithsonian Institute, Washington, D. C.—A. is informed that the power of a man is considered about one fifth of a horse power.—J. H. von H.—It would be better for you to obtain some article by advertising in our "Business and Personal" column.—J. H. W. will find the manipulation of nickel very much like working brass. He must learn by his own experience the adaptability of the metal to his wants.—R. W. S. can learn how to regulate heat by addressing J. N. Adams, Olathe, Kansas.—W. E. is answered thus: 1. Any earthen jar will do. 2. By burnishing with steel or bloodstone burnishers. 3. Leather called seahorse hide. —F. H. is informed that we see no particular objection to the present mode of making the wheels he refers to.—J. C. H. is referred to reply to L. O. B.—P. C. is informed that he is probably correct, as we understand his question.—J. G. R.—We can give no other information about the "new process" than that described in the newspaper articles that you enclosed.—P. N. is informed that the U. S. Government has made no such offer as he mentions.—H. R. had better consult works on astronomy for replies to his questions concerning the rotation of the earth, etc.—P. S. is informed that the publisher's price of Forney's work on the locomotive is $2.50.

(1) W. W. asks: How can I purify a whisky cask, so as to use the same for ice water and not have the water taste of the former contents? A. Wash with a strong solution of carbonate of soda in hot water mixed with some clean sand, and then with plenty of clean water. Or, after washing, fill with water and allow to stand for some time, and finally rinse thoroughly with clean water.

(2) G. H. W. asks: 1. Is manganese magnetic? A. When pure, no. 2. What is its value? A. Pyrolusite of good quality is quoted at ten dollars per ton in New York. 3. Does it pay to mine it when in large quantities? A. When of good quality, and the mines are so situated as to admit of cheap transportation, yes. 4. For what is it used? A. It is extensively used with salt for the production of chlorine for bleaching purposes, in the manufacture of glass, in paints, and dyes, as a source of oxygen, in some metallurgical operations, in the chemical laboratory, etc.

(3) T. J., of Toronto, asks: How long should wood require to be steamed before it will bend? What are the best kinds of hard wood for bending? A. The time depends upon the quality and form of the wood. No general rules can be given. Wood of recent growth is most readily bent. Hickory and ash are best.

(4) B. F. H. asks: 1. How large an engine, (oscillating) should I make for a boat 10 feet keel, 3 feet beam, 15 inch propellers, with a boiler 15 inches in diameter and 20 inches high? A. Cylinder 1½ by 2 inches. 2. How thick should sheet iron be for the boiler? How thick if made of copper? How much pressure will it stand? A. Iron ⅛, copper 3/32, pressure 75 lbs. 3. Do you think these dimensions are suitable for a boat of this size? A. They will answer very well.

(5) G. L. W. asks: What can be used for the purpose of making coal dust in block shape, and at the same time not destroy its burning qualities? A. There are numerous patented processes. You should apply to the inventors for information.

(6) S. H. M. asks: How large an engine and boiler do I need to run a boat 25 feet long and 6 feet beam? I want her for speed. How many will she carry? How large an oscillating engine must I have? A. Cylinder 4x6, boiler 3 feet diameter, 4 feet high. Such a boat can be made to carry 10 or 12 persons very comfortably, or more if desired.

(7) B. S. asks: What is the relative unity of resistance of an electric battery responding in a wire (Ohm's law) you refer to in your articles on telegraphy; is it the resistance in a copper wire or in a column of Hg of 1 yard in length? A. If we get your idea, the ohm or unit of electrical resistance is equal to the resistance of a prism of pure mercury, 41·7 inches in length, and ·001549 square inches section at 0° C. (= 32° Fah.) The internal resistance of batteries varies considerably. The resistance of conductors varies with their dimensions and temperature.

(8) M. P. asks: How much will a 20 horse power steam engine and boiler weigh, built of the best material? A. It will vary, according to the construction. A fair average will be about 8,000 lbs.

(9) N. P. M. asks: Will you tell me how to straighten two small, seasoned red cedar poles, of which I wish to make two canes? These sticks are valuable as souvenirs, and I wish to make them useful. A. It will probably be necessary to soften them by degrees, securing them in the successive positions.

(10) A. B. asks: Can you give me a description of how to make a good, cheap, sluice or rocker for washing gold out of gravel and surface dirt? A. We could not do the subject justice in this limited space. You should consult some standard work. The method practiced in Japan, which seems to be cheap and efficient, is described by Henry S. Munroe, E.M., in a pamphlet entitled "The Gold Fields of Yesso."

(11) C. R. B. says: A combined barometer and thermometer is now sold, the barometer tube containing a fluid which, when rain approaches, hardens and resembles ice. Are such barometers reliable weather indicators? What is the fluid used? A. They are not very reliable. Sometimes a solution of camphor is used, we believe.

(12) E. S. Y. says: We have two shafts parallel with each other. We wish to make the driver shaft do more work. A friend says increase the diameter of the pulleys. I say increase the width of the belt. He says it will convey more power with the same belt by increasing the pulleys ½. Which is right? A. You are both right.

(13) W. W. H. asks: What power does a reflector add to light? A. It concentrates the light.

(14) S. W. M. asks: What is best to paint a steam boiler and smokestack with, so that it will stand heat? A. Black varnish made from petroleum answers very well.

(15) G. F. says: A person seems to be under mesmeristic influence of a person they have not seen for two years. Can they be freed from such influence? A. We are not sufficiently familiar with the facts to enable us to answer the question.

Will a pulley covered with leather pull more than one of cast iron, perfectly smooth? If so, why? A. Generally, yes; because the co-efficient of friction is greater.

(16) G. M. B. asks: Will a boiler steam as fast (with the same fuel) with the water at the upper cock as it will with water at first cock, and why? A. In the majority of cases there will be no great difference, other things being equal.

Is the sting of a locust poisonous? A. Troublesome, but not fatal, we believe.

(17) J. W. F. S. asks: 1. If the stamps upon letters passing through the post were canceled, in the same way or with the same material as the stamps themselves are printed with, would it not be impossible to remove the cancelling without so far destroying the stamp itself as to remove all danger of its being used again? A. This method has been suggested before, but there is a difficulty in the way of properly using these inks with hand stamps.

Would the addition of salt to the water used for watering streets render it more effectual? A. Yes, but it is claimed to be unhealthy, and is injurious to the feet of horses.

(18) N. S. B. & Co., Ottawa, asks: What are the proper dimensions of a steam yacht between 35 and 40 feet long? And what size engine would be required to run her? A. You will find the required information in Nos. 69 and 81 of the SCIENTIFIC AMERICAN SUPPLEMENT.

(19) C. G. H. asks: What will remove the stain of nitric acid from black woolen goods? A. Wash with a strong hot solution (in water) of carbonate of ammonia. If this does not remove the stain it may be concluded that the acid has destroyed the coloring matter. This is usually the case. If the yellow stain remains, the only remedy will be to re-dye the material.

(20) I. E. R. says: I would like the latest and best books describing the diamond fields of the world? A. See article on the subject in SCIENCE RECORD for 1874. The works of Castellani and Emanuel on gems, diamonds, and precious stones may be of value. The American News Company of New York city, in 1872 published a work oh "The Diamond Fields of South Africa."

(21) E. C. H. asks how to cast a box on a bearing, and is answered by a correspondent thus: My plan is to give the journal a heavy coat of smoke, by holding it over fire of bituminous coal. While being smoked it is also becoming hot. I have filled a box on a inch and a quarter screw, square thread, four to the inch, four inches long, and had no difficulty in running it off from the screw after being cast.

(22) C. P. says: Where can I obtain information for building a machine for making ice? A. See reply to F. A. R. (No. 47) in No. 3 present volume SCIENTIFIC AMERICAN.

(23) F. S. C. says: Can you give me an analysis of the water of the Atlantic Ocean? A. The following is an analysis of sea water from the British coast: Potassium chloride ·766, sodium chloride 27·959, ammonium chloride, trace; calcium chloride, 3·666; sodium bromide, ·029; sodium iodide, trace; calcium sulphate, 1·406; magnesium sulphate, 2·296; calcium carbonate, ·033. Your second question, concerning a discrepancy in an analysis of water from Richfield Springs, we do not understand. We cannot give you the address of the professor mentioned.

(24) W. D. S. is informed that, provided the metals are brought into proper contact, it matters little whether the amalgamation takes place in the presence of water or not. Where the auriferous sand or dust from the quartz mill is emptied directly into the mercury, the amalgamation at best is very incomplete, and the mercury adhering to the dust occasions a great waste. Under such conditions the mercury becomes grossly contaminated, and is likely to yield an impure product in the retort.

(25) G. S. says: I cannot succeed in covering Smee battery plates (silver) with an equal coat of black oxide of platinum. I tried several ways, but fail to get an equal color. Also whether the platinum coating must be very dark, or if a grayish looking coat is sufficient? A. Dissolve chloride of platinum in about 100 parts of cold water. In this immerse the silver plate, and connect it by means of a wire with the zinc pole of a small battery. Then connect the positive pole of a battery with a small rod of clean carbon, also immersed in the platinum solution. Or a small porous cup containing a rod of zinc and water very slightly acidulated with muriatic acid may be used in place of the carbon anode; then, on joining the zinc and silver with a copper wire the platinum will be deposited on the silver as a black or grayish-black rough coating. The silver plate must be perfectly clean to secure a good deposit.

(26) A. P. H. says, in reply to casting box for shaft: Take the mandril out, wipe off all the grease, and then smoke the bearing in the blaze of a candle or lamp till it is covered with lampblack, then lay it in the boxes in the way it wants to run, and fit a piece of thin wood or board to the shaft on each side of the boxes, to keep the metal from running out, then moisten some bread to a paste and paste it in the cracks between the mandril and wood on outside of box. Put some paper between the upper and lower box tight to the shaft, to keep the two halves of the casting separate. Pour the metal through the oil hole.

(27) C. C. asks: How is nitro-benzole made? A. Nitro-benzole is commonly prepared by adding benzole carefully to a cooled mixture of equal parts of strong sulphuric and nitric acids. This solution, when largely diluted with water, yields a precipitate of the nitro-benzole. It is used to some extent by perfumers as a substitute for the more costly oil of bitter almonds, which it closely resembles in odor. It is also used for the preparation of anilin. It can be obtained from almost any large chemical establishment. The price of the purest preparation is about a dollar per ounce. In unskillful hands its preparation is somewhat hazardous.

(28) G. W. asks: 1. What will be the result if a tight vessel is filled with steam at 4 lbs. pressure to the square inch, and a gauge mounted thereon, then surround this vessel by another one, and let steam at 60 lbs. pressure into it, and around first-named vessel. Will the pressure in first-named vessel rise, and if so, to what height of gauge? A. The pressure will be slightly increased. 2. Will steam absorb heat as freely as it absorbs cold, or is it capable of absorbing heat with more rapidity than the water of the boiler in which it was generated? A. We think not, as we understand the question.

(29) L. O'B. writes: We have a well situated 650 feet from an outlet, the connection is a siphon of ¾ gallon pipe. From the surface of the water to the highest point it is 15 feet; then the pipe runs nearly level, a distance of 500 feet, when it makes a steep descent to the outlet, which is 10 feet lower than the level of water in the well. After laying the pipe, we pumped out the air, and the water ran for about 8 or 10 hours (going slower all the time) until the stream was only about ¼ inch, which would run for two days or more. Thinking there might be a leakage, we tested the pipe to 60 lbs. hydraulic, but found none. Then after starting the water nicely, we stopped the outlet for 14 hours; on opening, the water ran as before (a good stream at first) the same as when we first pumped it through. Now the questions are: What is the disease? and what is the remedy? A. The trouble is probably caused by the accumulation of air at the highest point, and the remedy is to attach a cock or valve for removing it.

(30) G. W. B. says: I am desirous of attempting to hatch eggs artificially, on a small scale. Can you describe an apparatus with which I can hatch say 100 or 200 at a time? At what temperature must the eggs be kept? In what position, and how often turned over? A. There are many details required for a successful apparatus, which we could not describe in this limited space. Now as you are willing to incur considerable expense in experiments, it will be better for you to inspect some establishment that is in successful operation.

(31) G. W. W. says: Given the plane of view, or delineating plane, perpendicular to the plane of the equator. Required to draw a map of the earth, showing parallels of latitude and meridian lines, the point of sight being outside of the earth and on a line passing through the center of the earth and perpendicular to the plane of delineation. The equator and the meridian line in the plane perpendicular to the plane of view will be represented as straight lines. How are all the other circles of longitude and latitude to be drawn, as arcs of circles or ellipses? If either, why, and how are they determined? A. You should consult a treatise on map projection.

What is the highest horse power to which the force of electricity has been made to work? A. There is scarcely any limit in the modern machines.

(32) H. F. L. says: I bored a well for a steamship company, some 2 miles out in Humboldt Bay. We struck a vein of burning gas at 86 feet. At 114 feet struck good fresh water for drinking and cooking, which is used by the vessels; but they say they cannot make steam of it. When heated it rises in white foam. Can you tell how it can be used for steam, or what is the cause of it? A. We need some more particulars to enable us to explain this. Possibly others who are familiar with the matter will send communications.

(33) C. R., Appingedam, asks: I have a smoke stack of 65 feet, and use as fuel wood waste from the planing mill; the sparks, or rather the burning wood chips cause accidentally fire in the yard or the neighborhood. What is the remedy? A. We imagine you can stop this in a great measure by the use of a spark arrester made of wire cloth, such as is made for a wood-burning locomotive. The number to which you refer is out of print.

(34) E. D. E. asks: 1. At what temper (by color) will steel bear the greatest tensile strain? A. Generally at a low temper. 2. Is iron tempered after it has been case-hardened? A. No.

I have a 3" x 4" vertical engine, cutting off at about ¾ stroke. What size of boat, and what diameter and pitch of a three-bladed propeller will it run with 80 lbs. of steam? What size of boiler will it require, and will a 2" plunger with a ½" stroke, attached to main shaft of engine, feed it? If not, what size will? A. Boat 22 feet long, propeller 2 feet in diameter 3 feet pitch. Boiler 26 inches in diameter 3½ feet high. It would be better to use a pump of twice the above capacity.

(35) W. E. B. says: Our house is overrun with cockroaches. We have tried two kinds of poison and have done no good. A. Mix fine plaster of Paris with double its weight of oatmeal and a little sugar. Strew this on the floor or in the chinks where they frequent. This is less objectionable than Paris green, and accomplishes its purpose nearly as well. Sumac leaves dried, ground to a fine powder, and, with a little blow-gun, driven into the crevices is certain and speedy in its work. Tannic acid mixed with a little lime may be used in a similar manner. A mixture of one part oxalic acid, one of sugar of lead, three of finely ground oak-bark, and a little flour, is also recommended. Kerosene, petroleum, turpentine, etc., are also fatal to these animals.

(36) J. V. R. asks: What is the essential difference between a magneto-electric machine for light

giving purposes, and one for electro-plating? A. Ordinarily there is little or no difference. In some of the Ladd and Gramme machines used for plating, arrangements are made so as to alter the quantity of the current and to admit the use of only a fraction, or all of it, as desired.

(37) A. P. F. says: I wish a recipe that will thoroughly water and mildew proof cotton canvas, and which will not injure the fabric when exposed to 280° of heat for 30 minutes. A. We think it will be difficult to devise a method that will, with any degree of satisfaction, answer all your requirements. Strong, hot solutions of alum or pyroligneate of iron (iron liquor) may be used to render such material mildew proof, and, if subsequently boiled in a strong solution of rosin soap, the cloth will be made reasonably waterproof, by the formation of insoluble alum soap or iron soap in the fiber.

(38) J. D. W. asks: How can I prepare sulpho-carbonate of potassium? A. It may be prepared by digesting for a few hours potassium sulphide with a slight excess of carbon disulphide, then adding a little water, and evaporating the whole dearly to dryness over a water bath.

(39) H. L. B. asks for a recipe for crystalizing tin plate. A. Wash the surface of the plate, previously warmed, with dilute nitric acid (1 of acid to 2 of water). As soon as the crystalline appearance is fully developed, wash it thoroughly in running water, dry, and varnish. 2. Please give me a recipe for turning tin blue and other colors? A. Tin cannot be stained or colored other than by paints or colored varnishes, etc. Use a filtered alcoholic solution of bleached shellac, colored to suit with any of the aniline colors. Very beautiful effects may thus be produced, as these colors are very real and transparent.

(40) H. E. W. asks: 1. Where can electric pile referred to in SCIENTIFIC AMERICAN of January 22, 1876, on p. 55, be found? A. The battery, we believe, is in the market. See our advertising columns of addresses of electricians. 2. Is it patented? A. Yes. 3. What effect does the peroxide of manganese in porous cell of Leclanché have on the carbon? A. It has no effect on the carbon—it serves to oxidize into water the hydrogen liberated at that pile. 4. What is the object of pounded carbon in the cell, and how much oxide is there in it? A. The carbon serves to decrease the internal resistance of the battery. The proportion of carbon and manganic oxide is variable, but may be about 1 part of the former to 3 of the latter. 5. Does the ammonium chloride in outer cell unite with the manganese and form an acid? If so, why? A. No; when circuit is closed the zinc dissolves in the ammonium chloride, forming ammonio-chloride of zinc. 6. What compound will unite with chloride sodium and form an acid? A. There can be no such reaction.

(41) C. L. P. asks: How does the fly walk on the ceiling? A. The flies' feet are provided with small, hairy, inverted cup-shaped cavities, capable of distending when pressed on a smooth surface, so as to form a slight vacuum, after the manner of the sucker. See "Hogg on the Microscope."

(42) G. C. asks: Is there a process for coating the fibers of cotton with silk? A. We know of none.

(43) W. E. asks: 1. What kind of a brush or buff do they use in the silver plating factories to put on the high finish on plated ware? A. It is done by burnishing. 2. Is there any other way to clean goods for plating besides scouring them with pumicestone and brush? A. Yes, by filing, scraping, and pickling in acids. 3. I would like to know about the patent on nickel plating? A. We refer you to the patentees.

1. What is the best way to clean brass bird cages? A. Wash with soap and water or a weak alkali. 2. What kind of varnish is put on to make them look so well? A. Shellac varnish can be used.

(44) T. A. P. asks: It is claimed that certain base-ball pitchers are able to throw a ball so that it will describe a horizontal curve in the air. Is such a thing possible, with a perfectly spherical ball and in a still atmosphere? A. We have never seen it done.

(45) H. D. E. asks: How is paper powder made? A. You will find information in No. 21, vol. 36. The proportions of the ingredients we cannot give.

(46) O. G. B. asks: What are roller skates, and are they patented? A. They are made something like a pair of sandals, but with rollers in place of skate irons. There have been some patents granted on them.

Could a copyright be obtained for a plan for organizing a society so that no society could make use of it without the consent of the owner of the copyright? A. Yes.

How much force could a spring, similar to the spring in a spring clock, be made to overcome? For instance, could one be made to wind up like the spring of a clock that would exert a force of 1,000 lbs., or 500 lbs., or any given number of lbs.? A. Yes.

Could a patent be obtained on a new plan for a lottery wheel or other contrivance for the purpose of lottery drawing? A. Yes.

Will any regularly organized order, having by-laws and officers, have to be chartered by the State? A. Consult your State statutes.

Is a raw cowhide, as it is taken from the brute, impenetrable to water? A. Yes.

(47) A. C. S. asks: What compound is used for making patent leather? Also how is it applied to get such a perfectly smooth surface? How long should it be boiled to give it the drying quality that boiled oil possesses? A. Patent or enamelled leather is prepared from hides that have passed through two operations; the first to render the leather impermeable to the varnish, and the latter to lay on the varnish. The hides are rubbed on the grain side with three coatings of boiled linseed oil mixed with ocher or ground chalk, and dried after each coating. The surface is then pumiced, and treated with general applications of the same material of a thinner quality. Over the surface so prepared are laid successive layers of boiled linseed oil, and of the oil mixed with lampblack and turpentine spread on with a brush. The surface, which has become black and shining, is then varnished with copal and linseed oil with coloring matters. The following is recommended: Boiled linseed oil and turpentine 20 lbs. each, thick copal varnish 10 lbs. and 1 lb. each of asphaltum, Prussian blue, or ivory black. Five coats of varnish are successively applied, and the colors are varied at will. Oil should be boiled until all the moisture is expelled.

(48) F. H. D. & Co. ask: Will you give me recipe for making a marking pencil for lumbermen, or marking packages? A. A perusal of the article on "Pencils" in Knight's "Mechanical Dictionary" (part 25), will probably give you the information.

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

W. W.—If minerals in slate pencil box are yours, they are: No. 1, mispickle, sulphide, and arsenide of iron. No. 2 is limonite—an iron ore. No. 4 is tennantite, or sulphide of iron, copper, and arsenic. The green piece is a hydrous arsenate of copper—tyrolite. No 5 contains antimony, iron, and silver.—E. A. S.—It is magnetic iron pyrites—pyrrhotine. It may contain more valuable metals.—J. E.—(Minerals in tin box). They contain silicates of alumina, magnesia, potash, and soda, sulphate of lime, and carbonate of lime. They do not necessarily indicate the proximity of coal or oil. Limestones are very common in oil regions.—M. S.—No. 2 is calcite. No. 5 contains galena—sulphide of lead. No. 6, the irridiated brassy-colored piece is chalcopyrite—sulphide of copper and iron. No. 7 contains iron and copper pyrites, oxide of iron, and a little carbonate of copper. No. 9 is amianthus. No. 10 is quartzose rock with pyrites. No. 11 is magnetic oxide of iron. No. 12 is clay slate with oxides of iron. No. 13 contains galena and probably silver. No. 14 is augite. No. 16 is galena. No. 17 is mica-schist. No. 18 crystals of carbonate of lime. No. 21 is a clay with much oxide of iron. Nos. 1, 3, 4, 8, 19 and 20, are missing.—F., of Curaçao, South America.—The sample of pitchy material sent was probably formed by the evaporation of the more volatile constituents of a petroleum. It contains a large percentage of earthy impurities. It is probable that higher up the ravine referred to a more valuable oil may be obtained. Its commercial value could be definitely determined by an analysis. Its destructive distillation will yield a very rich illuminating gas. It probably contains some paraffin.

COMMUNICATIONS RECEIVED.

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

On Boiler Joints. By F. G. W.
On Snakes Catching Fish. By E. A. P.
On Hog Cholera. By ——.
On Submarine Torpedoes. By ——.
On an Apparatus for Analyzing Polarized Light. By W. L.
On the Brown Bat. By C. F. S.
On the Seventeen Year Locust. By R. K. S.
On a Telephone. By N. T. McK.
On a Tidal Motor. By A. S.

Also inquiries and answers from the following:

S. A. S.—F. P.—C. F. M.—P. N.—E. A. S.—D. B.—M. H. M.—A. I. F.—C. B. L.

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.

Inquiries 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 makes paper balloons? Who makes assays of minerals? Who deals in canary birds?" 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.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 19, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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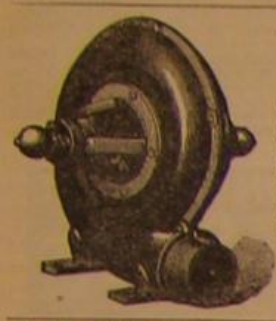

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