

spacious room in which engines and boilers are located. The engines, two in number and of forty horse power each, are horizontal, and are connected directly to pinions which engage in large spur wheels arranged between the two winding drums. The latter are 12 feet in diameter, and to each are brought two 1 1/4 inch steel wire ropes, which serve to hoist and lower the trucks. Inside the engineer's house above are counterpoised levers connecting with the throttle and link, and a treadle operated by the foot, which governs friction and vacuum brakes on the drums. The average time of raising one car, while lowering another, is one minute, though the same can be done with safety in half that interval. The work was begun on July 1, and finished in November 21, 1874. Mr. John P. Endries is the designing engineer, and the Dickson Manufacturing Company, of Scranton, Pa., the builders. The total cost was \$80,000. We understand that it is proposed to construct another and similar elevator further to the north, at a point where the ridge is 230 feet high.

The new distributing reservoir, now in process of construction under the supervision of Mr. J. P. Culver, Chief Engineer of the Jersey City Water Works, is located on the summit of the hill and between the positions of the elevator and the Delaware, Lackawanna, and Western tunnel. For many years past the Bergen reservoir, a small structure holding only a three or four days' supply for the city, has served the purpose of a distributor; but the increasing population has necessitated the present building, of larger accommodations. Work was commenced on the new reservoir in 1870, and will, it is expected, be completed so that a portion of the reservoir can be used during the coming fall. The area of the structure is 27 acres, or 700 feet wide by 1,700 feet long. Its capacity will be 23,000,000 gallons, this being a supply for 23 days. The depth of water will be 25 feet. The receptacle is divided into two portions, either or both of which may be drawn upon at will, and is surrounded by a heavy stone wall and puddle bank, the former 18 feet in height. The cost, up to the present time, is said to be half a million dollars. The means of supplying this reservoir consists in a huge siphon 30,075 feet long, which joins it with the reservoir at Belleville. The siphon has a fall of 29 feet, and is composed of three separate pipes resting upon a trestlework bed, which is constructed over the meadows. The oldest pipe is twenty inches, and the others, which have been placed quite recently, are thirty-six inches, in diameter. One of the latter is of cast iron; the other is worthy of special remark, as it is made of one eighth inch boiler iron, riveted together and covered inside and out with two inches of hydraulic cement.

It is interesting, by way of conclusion, to sum up the aggregate amount which has been spent in overcoming the rocky obstacle which Nature has placed at the very threshold of the metropolis, and through, over, or under which lies the most direct line from the West and South to the great market. The open cuts we placed at one million, the Bergen tunnel another million, the Delaware, Lackawanna, and Western tunnel eight hundred thousand, and the car elevator eighty thousand dollars; total, two millions eight hundred and eighty thousand dollars, or, including the second car elevator, in round numbers three millions of dollars.

SCIENTIFIC AND PRACTICAL INFORMATION.

HETEROPLASTY, A NEW MEDICAL DISCOVERY.

Skin grafting, as we have taken occasion to explain in some detail, is the removal of a piece of skin from the sound part of the body of the patient, or from another individual, and placing the same upon the raw surface of an obstinate ulcer, burn, or other wound. By thus creating centers of eccentric cicatrization on extensively injured surfaces, the rapidity of the healing process can be much accelerated.

Dr. R. J. Levis, in an extended article on this topic which we transferred to our columns some months ago, alluded to the possibility of obtaining the necessary grafts from limbs amputated for traumatic injuries. This has been repeatedly tried by Dr. Anger, of Paris, and with such remarkable success that the result is considered as certain as if grafts directly obtained from the patient were employed. Dr. Anger, however, proceeds further, and has used, not merely epidermic grafts, but those comprising much thicker layers—dermo-epidermic, he terms them—and finally he is enabled to employ the entire thickness of the skin, and even the subcutaneous cellular tissue. He has successfully transplanted grafts of the last description from 0.3 to 0.6 inch in diameter, obtained from the palmar face of an amputated finger. These were applied to an open ulcer on the leg of the patient and bound in place by diachylon bandages. Three days after the grafts were intimately united with the injured surface and manifestly vascularized. Heteroplasty is the new name given to the operation.

THE CHEMICAL CONSTITUTION OF THE BRAIN.

M. Gobley has recently completed extended investigations on the above subject, from which we adduce the following results: The human cerebral substance contains about 80 percent of water. Two albuminoid matters are present, one not differing from albumen and soluble in water; the other is insoluble, and for this the investigator proposes the name of "cephaline." The fatty substance of the brain is formed principally of cholesterin, lecithin, and cerebrin, and also olein and margaric. The organ contains certain salts, some soluble in water and in alcohol, others soluble in water and not in alcohol. During decomposition, the cerebral pulp furnishes acid products, among which are oleic, margaric, phospho-glyceric and phosphoric acids.

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THE GENERATION OF THE WICKED.

It is a fortunate circumstance that vice is ultimately self-destructive. Lust, violence, and debauchery are killing in themselves; and the children of the brutally vicious are very apt to enter upon the struggle for existence weighted with such an inheritance of weakness and disease that their early extinction is all but inevitable. It is a law of nature that the generation of the wicked shall be cut off.

To this beneficent law, however, there are serious exceptions. Certain phases of criminality—as may be seen any morning in our police courts—are not only consistent with but are usually accompanied by abundant animal vigor, capable of indefinite propagation; and the probabilities are that the criminals of future years will be chiefly descended from the sturdy sinners for whose restraint the police systems of to-day are mainly required. The criminal class, like the pauper class, is to a great extent an hereditary caste, representing the uncivilized and largely uncivilizable elements of the community. How to deal with this class, how to turn its perverted forces into useful channels, and make its perpetuation difficult if not impossible, is the great social problem of the day.

Victor Hugo has said that the quickest way to civilize a man is to civilize his grandmother. The saying is worthy of a place among the axioms of social science. Certainly when society neglects the grandmother—as it did in the case of the waif called "Maggie" (referred to in our paper of January 9), to whom Dr. Harris traces such a pestilent brood of human vipers—the succeeding generations are pretty sure to pay a heavy penalty in perpetuated savagery. Probably each one of the small army of criminals, lunatics, drunkards, imbeciles, and the rest, to which she gave being, has cost the country more than would have sufficed for the reclamation of a dozen such grandmothers to be, certainly enough to surround them with conditions which would make it impossible for any one of them to stock a country with criminals and paupers.

It will not take many such cases, it is to be hoped, to rouse the community to an appreciation of the urgent need of greater watchfulness in regard to the development of vagrant children, and all children not subject to wholesome influences. Who can say how many Maggies are skulking about city and country to-day, or cowering in homes of bru-

tality and vice, receiving the training requisite for making them criminals and breeders of criminals? For its own safety, let alone the children's present and future welfare, society is bound to adopt more liberal and thorough measures for removing such heirs of crime and criminal poverty from their corrupting environment, and for training them in ways of industry and morality.

It may be impossible to make much of such unpromising material, nevertheless it is possible to prevent much; and with social as well as with individual disease, prevention is better than cure. Every boy or girl growing up in beggary and lawlessness is the possible ancestor of a line of pariahs as numerous and burdensome as Maggie's have been; and neither prudence nor philanthropy can tolerate the neglect of them. As a matter of justice, too, society has as little right to allow the future to be afflicted with the pernicious fruit of such pernicious stems as it has to stock the fields with poisonous plants, or knowingly to establish the conditions for the development of future pestilences.

How Can Society Help Itself?

Primarily, by civilizing, so far as possible, the naturally uncivilized grandmothers, not forgetting the grandfathers also, by bringing them up in habits of honest industry in useful occupations: not in unnatural masses in prison-like asylums, but in workshops and families. This done rigorously, the criminal class will be largely cut off by conversion into something better. We shall have cause for thankfulness when so much is done. But the time is probably coming when society will see the necessity of taking still more radical measures for the prevention, not only of possible crime, but of possible criminals. In a more immediate and active sense than the words now carry, the generation of the wicked will be cut off.

Nature's processes for effecting this end are, like most other natural processes, very slow and very wasteful; still more, they are very unjust, since the innocent suffer far more than the guilty. The lusty vagabond leads a jolly life, filled to the end with all the enjoyment he is capable of; and leaves behind him a numerous progeny to pay the penalty of his misdeeds in hereditary poverty, impoverished constitutions, depraved tastes, wasting diseases, and other conditions of early defeat in life's engagements, and the morally and physically healthy are taxed for the support of almshouses, prisons, asylums, hospitals, and other places of refuge for them. For the victims, as well as for humanity at large, it were better had they never been born. We do well to make the most of them after they are born—or rather, we should do well did we do so; but would it not be infinitely better all round could their existence be made impossible from the outset?

Advantages of a Diminished Birth Rate.

The rational tendency of high civilization is toward a diminished birth rate. The waste of life that goes on in ruder societies, through wars public and private, through improvidence and unhealthy conditions of living, is immensely lessened in civilized communities, and with it the need of many births. A vastly larger proportion of the children born are able to attain maturity, and the average duration of life is much increased. A low birth rate is therefore perfectly consistent with high national power and progress, and the development of all that makes life desirable; and, as we have said, the tendency of civilization is always to attain such an economical birth rate.

But unfortunately, while the law holds good in the upper grades of civilized society, the lower and more or less uncivilized grades are under no such moral restraint. Improvident in all things, they are equally so in human life. Careless of the responsibilities of parentage, they breed like vermin; and since society throws around their offspring so far as possible all the sanitary conditions and advantages of civilization, the descendants of the lower half of any community are pretty sure to preponderate numerically. The criminal grades are especially prolific, more than enough so to make up for the destructive influences of crime. The effect upon the future well being of society can scarcely be other than disastrous, unless special effort is made to counteract the evil by preventive as well as by curative means.

The Knife Remedy.

We can only regard it as an illustration of the power of popular prejudice that people, who find nothing to condemn in the extermination of individuals whose murderous nature seems incompatible with public safety, are ready to hold up their hands in horror at the most guarded suggestion of the advisability of making it impossible for lusty savages to inflict upon the community a brood of ill balanced organisms, destined to swell the ranks of vice and crime. Yet society may be driven to adopt just such radical measures in self-defense, driven to make sterility one of the penalties for the grosser forms of criminality.

The effect on the criminal statistics of this city for the next hundred years would be something marvelous, we fancy, were the worst offenders against public peace and morality sent to the island—not as now to recuperate their wasted forces and return in a few weeks to enter more lustily than ever upon their evil courses—but to be made perfectly harmless as regards the future. In this way only, can the stream of tendency which makes for unrighteousness be dried up at its source.

It has been objected that the subjects would be spoiled as human workers, through loss of ambition and energy; but the objection scarcely holds in view of the fact that their representatives in the East have from the earliest times been prized for their serviceableness. Besides, they are of little worth as workers as they are, and the change would rather tend to diminish their rampant beastliness and make them more amenable to civilization. Many an unmanageable

human brute might thus be converted into a quiet toiler, as useful and harmless as the placid creature whose patience under the yoke of labor is proverbial. At any rate, his higher potency for evil would be eliminated. The operation is not an uncommon one for the saving of individual health: How much more justifiable, then, for the protection of the moral health of the community—for the prevention of that worst of social distempers, hereditary crime?

HOW TO RUSH A PATENT THROUGH.

It appears that the best way to get a new patent rushed through and quickly issued is to apply at the presidential mansion. In a recent case—a telegraph contrivance—the President wrote a letter to the Commissioner of Patents, requesting him to take immediate action, for the reason that the invention was needed for use by the government, and had already been adopted on the government lines. Whereupon the Commissioner issued a patent, “quicker,” to use a homely expression, “than you could say Jack.” But we think it will strike most of our readers, as it does ourselves, that the reasons assigned might have been more properly used for postponing instead of hastening the grant of the patent. In the case of a poor inventor, whose application has been long pending, the Patent Office should be as prompt as possible. But with respect to inventions for which the government patronage has already been secured, as in the present case, what possible difference can it make to the government whether the patent is granted today or next month?

All unnecessary interference with the usual order of business at the Patent Office, whether by the President or any other public functionary, is pretty sure to create dissatisfaction, and should be scrupulously avoided. Instead of writing requests to favor the interests of his personal friends, it would be much better if President Grant would indite communications something like the following:

To the Commissioner of Patents:

I am informed that many applications for patents are lying in your Office unexamined, and that, in the class which embraces telegraph apparatus, there are cases filed more than a year ago, which still remain undisposed of. This is a crying shame and ought no longer to be tolerated. No class of individuals has done so much for the benefit of the country as our inventors; and when they apply for patents, every possible endeavor ought to be made by the Patent Office to give them a prompt and favorable hearing.

With the large corps of assistants under your command, numbering, as I understand, about five hundred persons, including one hundred examiners, is it not possible for you to bring up the business now in arrears, and in future have things attended to with more promptitude?

I see by your report for last year that you rejected between five and six thousand applications for patents. It must have required an immense amount of time and labor on the part of your people to hunt up reasons for this enormous mass of adverse decisions.

Do you fully realize that the majority of these five thousand rejected applicants are poor people, and that your rejections, especially if wrong, carry injury and disappointment into that number of families?

For my part, were I Commissioner of Patents, I would not hesitate to grant a hundred doubtful patents rather than take the risk of depriving one of my inventive countrymen of the full benefits which the law intended to give him.

I beg to remind you that the object of the Patent Office, as intimated in the Constitution, is to encourage the progress of the useful arts by the grant of patents to inventors. But if I were to judge, from your great number of rejected cases, I should say that the Patent Office appeared to consider its prime duty to be, to refuse to grant patents.

I have confidence in your ability to remedy the unsatisfactory state of things I have mentioned, and I shall look to you for immediate and effective action. Let us have peace.

U. S. GRANT.

SPONTANEOUS COMBUSTION AT STEAM HEAT.

A correspondent (W. A. S.) sends a piece of charred wood taken from a plank which formed a portion of a box inclosing a steam pipe conveying steam at a pressure of about 80 lbs. per square inch. The wood is as completely charred as if it had been prepared by the ordinary process of burning. It is black, friable, and thoroughly deprived of all its volatile constituents.

This is a simple illustration of what occurs very frequently at temperatures exceeding 300° Fah. The moisture and volatile matters contained in woody fiber are driven off and carbon only is left, at temperatures exceeding 300°, the rapidity of the change increasing as temperatures rise. The precise lower limit of temperature of charring is not known; but when that above given is approached, the change occurs very slowly. As stated in a previous issue of the SCIENTIFIC AMERICAN, a piece of wood has been left in contact with a steam pipe conveying steam, during the cold season, at 50 lbs. pressure, for sixteen years, without exhibiting evidence of serious injury. The temperature there was about 295° Fah. Violette charred wood at 302° Fah., and the temperature of the steam which produced the carbonization referred to by our correspondent was about 325° Fah.

In order that combustion shall occur, it is evidently necessary, not only that the temperature shall be sufficiently high to increase the tendency to ignition, but that it must actually attain the temperature of ignition; and to produce spontaneous combustion in such cases, the temperatures of carbonization and ignition must coincide. In our issue of January 2, we showed, by the graphic representation of the law of decrease of temperature of ignition, with that of carbonization, that it was approximately expressed by a parabola and that, unless some sudden change of law occurs at lower temperatures than those recorded, this coincidence cannot take place, and that, consequently, wet steam at ordinary pressures cannot ignite—although it may char—woods

Our correspondent speaks of this piece as “almost burnt to charcoal.” The expression and the idea represented by it are incorrect. Charring and burning are two quite distinct processes. The one is the expulsion of gaseous constituents from organic matter; the other is the rapid union of any combustible material with oxygen. It does not, by any means, follow from the fact that the wood is charred that there has been any oxidation or true “burning.” Wood becomes charred in the process of burning, usually, merely because the oxygen seizes upon the volatile constituents first, and only takes the carbon when it may not choose between equally available molecules of the two classes of combustible substances. The slow process of carbonization illustrated by the example given by our correspondent, the more rapid process of charring in the usual methods of manufacture of charcoal, and the charring noticed when wood burns in the fire, are all identical, except as to time and completeness. Ignition and combustion are entirely independent processes, and we have no evidence which seems reliable that the gases can take fire at temperatures lower than about 800° Fah., or that charcoal can ignite at less than 600° Fah. We do not think it impossible, or even improbable, that, under peculiar and rarely occurring circumstances, the condensation of inflammable gases within the pores of charcoal, which is a wonderful absorbent, or its saturation with readily oxidating materials, like the oils, may, by oxidation, be gradually accelerated in rapidity of action, and produce spontaneous ignition and combustion. We have, however, no knowledge of well authenticated instances even of this. Our correspondent will probably find it necessary to actually apply flame to his charcoal board to set it on fire. He will also notice that wood “smokes” before taking fire—an indication that the temperature of carbonization is probably lower than that of ignition.

AN IMPORTANT PATENT OFFICE DECISION.

We published last week a recent decision by the Commissioner of Patents, in which he announced the adoption of a new rule and practice at the Patent Office in respect to old rejected cases. The decision was to the effect that rejected cases of more than two years' standing are not in future, except under certain circumstances, to prevent the grant of new applications for patents. This decision substantially recognizes and adopts the view expressed in the previously rendered decision of the Board of Examiners-in-Chief in the case of Greenleaf and Adams.

The latter decision, in addition to the above dictum, contains another important announcement, to the effect that the Board of Examiners-in-Chief is a tribunal having independent judicial powers. Its decisions are, therefore, binding upon the Commissioner and all persons and actions of the Patent Office, until set aside by a higher tribunal.

This is a very interesting and important adjudication, because, when properly recognized, its tendency is to render the decisions and practice of the Patent Office more uniform and reliable than heretofore. The notion has heretofore prevailed that the Commissioner was the absolute ruler of the Patent Office, and that he might, if he saw fit, set aside any decisions of the Examiners, or of the Board of Examiners-in-Chief. But it now appears that he cannot lawfully do so.

The decision is very ably written, and is so interesting and important that we commence the publication of the text in full on another page

CHILDREN AND DOGS.

“Dogs is healthy for children” say the old wives, and not without some foundation in fact. The influence of these lively and affectionate playmates of childhood is very happy: so much so that we have sometimes thought that a boy who has never had a pet dog has been cheated out of half the enjoyment and no small part of the moral culture of infancy. But dogs have bad tricks, and, unless properly trained, are apt to be anything but “healthy” for children. They express their affection in a very bad way. We know that it is a common opinion that there is something wonderfully wholesome about a dog's tongue, and that his natural habit of licking the objects of his affection is rather to be encouraged than repressed. Nevertheless one of the first requirements in a dog for a child's pet is that he be trained to emulate prudent humanity and restrain his tongue. It is not “healthy,” whatever the old wives may say. This, setting aside the question of rabies altogether. A much more common affection of dogs is a tape worm, for whose development both men and dogs have to contribute. Its immature or cysticercal stage is spent in the human body, often causing great mischief; then it migrates to the dog, completes its development, and makes provision for a new crop to infest humanity, forming cysts or hollow tumors in various parts of the body. The full grown worm is the smallest tenia known, only about $\frac{1}{4}$ of an inch in length. The embryo is often as small as $\frac{1}{100}$ of an inch; yet, according to Cobbold, death has been caused by a single individual lodged in the brain. At a late meeting of the Australian Microscopical Society, Mr. Sidney Gibbons exhibited specimens recently taken from a human subject, and said there could be no doubt that they were frequently implanted in children as a consequence of allowing dogs to lick their hands and faces. It is a nasty practice at best, and a pet dog's first lesson should be to keep his tongue to himself.

LABOR TROUBLES IN RUSSIA.

The first fruits of emancipation in Russia and in our Southern States have been much the same. Like the freedman, the serf released from practical slavery thinks that freedom means the right to do nothing and go where a vagrant in-

clination may lead him. Serfdom meant involuntary servitude and confinement to his native district, and naturally his undisciplined sense of liberty impels him to do the opposite. So he wanders about, and works only to keep from starving. Under the old system, a pauper peasant was an impossibility; under the new, the lowest poverty is the rule. The effect on the industrial interests of the country is little short of ruinous. Labor cannot be obtained, even where wages are relatively high, as in the fertile provinces of the South and Southeast, without prepayment, sometimes to the extent of eight months' wages, and that without any security that the work will be done. That a contract is in any way binding is quite beyond their moral comprehension. If paid in winter to secure their services in the spring, they are quite as likely as not to be missing when the stipulated time arrives; while those who do report for service are in the habit of deserting at the most critical moments without warning and without cause. Factories are abandoned in the stress of business, though the men have signed regular contracts; and farms are left untilled, unsown, or unreaped, simply because laborers already paid prefer to work for a neighboring proprietor. The money paid in advance cannot be recovered, nor the deserters punished for their treachery. Not that there is no law to reach the case; the trouble is the justice, whose duty it is to regulate such matters and decide in labor disputes, invariably favor the workmen. “The mass is a powerful fellow,” they say, and decline to take any steps to bring themselves into disfavor with the “powerful fellow” who votes them into office. The agricultural development of the country is especially hampered by this lack of trustworthy workmen, and large tracts formerly under cultivation are being turned into grazing land; while the peasantry gain only in poverty and improvidence, living from hand to mouth, and spending the most they earn in vagabondage and brandy. The matter has lately been taken in hand by the Government, and a new commission appointed for the codifying of the laws of contract and other labor regulations. It is hardly to be expected, however, that any speedy amelioration of the trouble will be effected.

HORSE FLESH AS FOOD IN FRANCE.

Though among the last of the people of northern Europe to authorize the sale of horse flesh as food, the French have learned to use it to a greater extent, apparently, than any other nation. It is used in as many ways as beef; and according to a late writer, M. Husson, in the *Economiste Français*, the trade in it is actually more profitable than the ordinary butcher's business.

On the first day of 1874, there were in Paris forty-eight shops for the sale of the flesh of horses, mules, and asses, their customers belonging chiefly to the middle classes—clerks and thrifty workpeople with families. As a rule, the price of the meat is about half that of beef, the best cuts ranging from a franc to a franc and a quarter for the half kilogramme, or from twenty to twenty-five cents a pound. It is in the form of sausage, however, that the largest quantity of this meat is consumed. The tongue, brain, and liver are sold as delicacies, and the fat is converted into “butter.”

In consequence of the increasing taste for horse flesh, the price of worn-out horses has increased enormously of late, those fit for food fetching from twenty-five to thirty dollars: a few years ago they could be had for five or ten dollars.

From unpublished official documents, M. Husson finds that the number of horses, asses, and mules, consumed in Paris during the seven years and a half preceding 1874, was 73,655, more than half of which, however, were eaten during the two sieges. Since the war, the number eaten annually has been from nine to ten thousand. In Munich, Berlin, Vienna, and other German cities, the growing taste for horse flesh is almost equally marked.

Curiosities of Welding.

There has lately been shown in this country a very interesting specimen of blacksmith work. By means of Schierloh's welding compound, it is alleged that, in one example of a bar of Bessemer steel, five different kinds of iron and steel have been perfectly welded, without changing its shape in the least. The bar was rolled into form at Thompson's steel works, in Jersey City, and is $\frac{1}{2}$ by $2\frac{1}{2}$ inches in the cross section.

First, a piece of Bessemer steel, cut from the end of the bar, was welded fast to it again, the heating and welding occupying eight minutes. On the reverse side of the bar a piece of fine cast steel was welded in six minutes. Further along on the bar a piece of blister steel was welded in eight minutes. This same steel cannot be welded with borax, as the high temperature needed with that flux makes it as brittle as cast iron under the hammer. Opposite this a piece of wrought iron was welded in six minutes, and further along on the bar a piece of cast iron was welded in three minutes. This was a piece of the mold board of a plow. The bar, with its additions, was then ground and polished on the edge, so as to show the points at which the welded metals came into contact. No weld was visible on any one of them, and the difference in the metal could only be told by the color after polishing. This solves a great many important problems in iron manufacture, among others the welding of Bessemer scrap

Annual Report of the Commissioner of Patents.

The annual report of the Commissioner of Patents to Congress has been sent in, and shows that 21,602 applications for patents were made during the year 1874, and 13,599 patents were issued, leaving 8,003 applications, or 37 per cent of the whole, that were either rejected, delayed, incomplete, or for some other reason not patented. We shall give a more full abstract of the report in our next