

bility of putting a larger number of pieces in a flask, of making more molds, and of getting out much better work.

We may add that the specimens of castings exhibited to us, as coming directly from molds thus prepared, appeared fully as sharp and clear as those from the best hand-rammed molds. Nor does the intricacy of the pattern seem to cause any difficulty, as we were shown molds for very irregular blind hinges, and completed castings for bank locks, the latter weighing some 30 pounds each, and of considerable intricacy of form. We also remarked that, through the evenness of the ramming, the waste through imperfect casting of large numbers of keys, hooks, and similar small goods was very small, almost every object coming from the sand true in shape.

Our readers can draw their own conclusions from these simple facts, so that we forbear further comment. We examined the score or more machines which the manufacturers, Messrs. P. & F. Corbin, of New Britain, Conn., had in use in their factory, noting in every instance the ease and rapidity with which they were handled by the workmen. The amount of pressure to be applied to the lever seems to be the only point requiring practice to judge; but that this knowledge is readily acquired, is proved by the work of the unskilled hands above detailed.

The patent granted to Albert Eames and John P. Broadmeadow, of Bridgeport, Conn., under which the device is manufactured, was extended November 25, 1873, and many essential improvements are covered by another patent dated August 4, 1874. Further particulars may be obtained by addressing the manufacturers as above, who are the sole licensees for the sale of the machines.

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OUR FEVER NESTS AND THEIR REMEDY.

Though blessed by nature with a situation unrivaled for sanitary advantages, New York has a death rate such as few cities in Christendom can equal. The appalling mortality of the past summer, especially among children, has given rise to a great amount of sorrow and indignation on the part of the daily press, and not a little severe criticism of the action of the medical and police authorities, the common theory being that the enforcement of proper sanitary regulations would have prevented the larger part of the needless loss of life. That much might have been done to improve the health of the city by more rigid sanitary measures, there is

no doubt; but it is useless to expect a Board of Health, however efficient, to achieve impossibilities. The great source of disease and death in the city is the tenement house system, whereby families are massed by the hundred in huge barracks, destitute of light, ventilation, the means of keeping clean—of every appliance, in short, for healthful living; and until wholesome dwellings can be substituted for these dens of disease, New York must endure the shame of being one of the most unhealthy cities in the world. No other city, in its densest portions, crowds half as many inhabitants to the acre as can be seen in some of our lower and eastern wards, and nowhere are the dwellings so poorly fitted for a numerous occupancy. And not only are these huge hives, with narrow halls and lightless sleeping rooms, crowded from the roof to the pavement with poverty-stricken families, but underground, in damp, unwholesome basements, multitudes find miserable shelter. Says the Children's Physician to one of the largest dispensaries: "An experienced dispensary physician can detect a patient who comes from a basement simply by the sense of smell"! Is it any wonder that the deaths of children in such a house number five or six a week? Or that a week of excessive heat may swell the weekly death list of children under five years of age by four or five hundred? About two thousand of these candidates for early death are born in our tenement houses every month.

With high culture, scientific management, and abundant means, it may be possible for many families to dwell together in health and safety under one roof; but where ignorance, poverty, and filthy habits prevail, the massing of families is little short of pestilential. Only by the dispersion of the tenement house population can the now over crowded wards of the city be made tolerable, and the death rate reduced to reasonable limits; and we see no way by which such a desirable result can be effected humanely, save by providing means for carrying the poorer working people to and from country homes more rapidly and cheaply than is possible with surface roads.

To some extent it may be necessary to do for this class of the community what Mr. Stewart is doing for the more fortunate in his Garden City (a description of which was given in the SCIENTIFIC AMERICAN about a month ago), and that is to build country cottages for them.

The success that has attended the operations of the Artizans', Laborers', and General Dwellings Company, in providing cheap suburban homes for the working men of the larger English cities, is proof that such enterprizes may be profitable as well as philanthropic.

In connection with the recent inauguration of one of their villages, the London Times gives a detailed account of the history of this company and of the work it is doing. The new village, called Shaftesbury Park, will illustrate its mode of proceeding. The site embraces forty acres. The foundation stone was laid in August, 1872; and it is expected that, by the opening of the coming winter, 749 of the intended 1,200 dwellings will be ready for occupation. The houses are engaged long in advance of their completion, while over 1,200 applications, for houses still to be built, are on the books. The dwellings are of four distinct classes: Class 1 contains eight rooms—a front parlor with bay windows, a backroom for meals, a kitchen with dresser and kitchener, a small larder, a scullery fitted with copper and sink, a closet, ash pit, and coal cellar; while on the floor above are three bed rooms and a bath room. Class 2 are seven roomed houses, without the bath room. Class 3 have six rooms, and class 4 have five rooms, of which two are bed rooms. Gas and water are laid to every house. Ventilators are supplied to each room: and the drainage (except surface water) is carried back from the closet and sink in the rear, so that no drain passes under any house. The foundations are of concrete, and the roofs are of slate. The paths have been laid with asphalt, and shade trees have been set out. There is also a temporary lecture hall, now used as a school room. School houses will soon be built, and baths and wash houses are projected. A site is left for a cooperative store, and two acres and a half have set apart for park and playground.

The houses have been built, to a great extent, on the cooperative system, the work being let out, under foremen in each branch, to the bricklayers, carpenters, painters, plasterers, slaters, and plumbers employed, and it is reported, as a matter of special satisfaction, that, under the piecework plan which has been adopted throughout, union and non-union workmen have worked harmoniously together, and there has been no cause for the intervention of the appointed arbitrators. Many of the workmen are shareholders in the company, and not a few of them live in the houses they have helped to build. The result of this arrangement has been unusual care in the finishing of their work. The houses built by the company, the directors say, are better than those usually erected, yet they can be sold at equally low prices, in consequence of the materials saved by the workmen, who are shareholders. It is further claimed that these interested workmen earned, by piecework, forty per cent more than their ordinary wages.

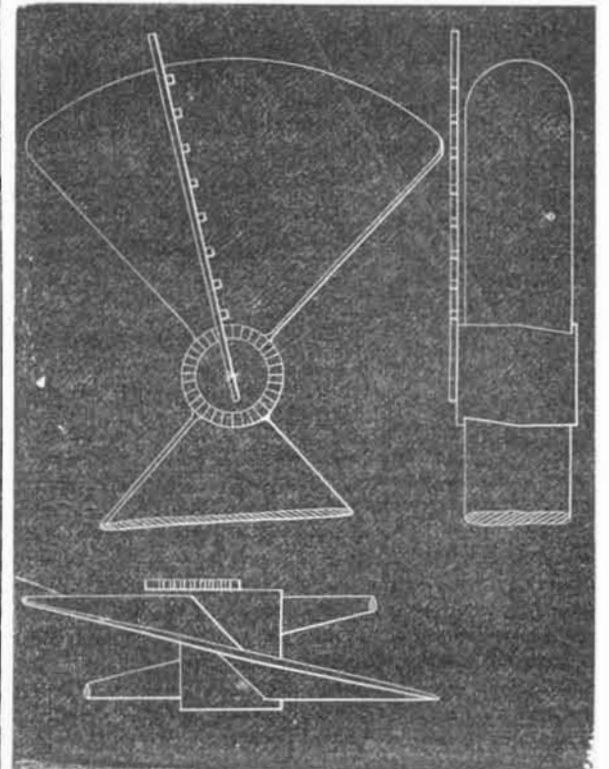
The growth of the company in popular favor is shown by the annual amount of stock taken. At the close of the first year, 1867, the share capital in hand was only \$2,500; at the close of the next year it was \$9,000. In 1869 it rose to \$15,000. In 1870 it was \$30,000. In 1871 it increased to \$92,500. In 1872 it rose to \$260,000, and at the end of 1873 it was \$560,980. The last annual dividend was six per cent, and previously they had divided seven and a half per cent.

Were our means for cheap and speedy transit equal to those of London, villages like this might be multiplied indefinitely along the Highlands, in Westchester, and on Long Island. The advantage, not only to those who would thus

be enabled to take their families into wholesome air, but to thousands who would of necessity remain within the city limits, would be incalculable.

MEASUREMENT OF A SCREW PROPELLER.

A correspondent asks for a rule for measuring the pitch of a screw propeller. The process, though simple, requires considerable explanation to make it understood, and as the subject will doubtless be interesting to many of our readers, we devote some little space to its consideration. The surface of a screw propeller is the same as would be generated by a line revolving around a cylinder, through the axis of which it passes, and at the same time advancing along the axis. In this way the under or back surfaces of the blades may be supposed to be formed, and then the proper thickness is put on, so as to make the front or entering surfaces. All measurements of a blade should of course be made on the back surface. It will be evident, from the explanation of the manner in which the surface of a blade is formed, that by varying the shape of the generating line, or the rate of its motion along the axis, very different forms of blades can be produced. The pitch of a screw is the distance the generating line moves in the direction of the axis, while it is making one revolution around the cylinder. It is evident from this that the pitch of the screw may be constant throughout, or it may vary from forward to after part of the blade, or from hub to periphery, according to the rate of motion of the generating line in an axial direction, and its angle of inclination to the axis. Hence in measuring a screw propeller, it will be necessary to determine the pitch at a number of points, for the purpose of ascertaining whether it is variable or constant. Every point in the generating line describes a curve which is called a helix. If measurements are taken along one of these helices, they will show whether the pitch varies from forward to after part of the blade, and measurements on corresponding points of different helices will indicate whether or not the pitch is constant from hub to periphery. As a general thing, the hub of a screw propeller is faced off at the ends, and the blades do not overhang a plane passing through this face. If necessary, however, a faced surface can be fitted to the hub, and made thick enough for its plane to clear the blades. Provide a straight edge a little longer than the radius of the propeller, and secure cleats for it, every foot of its length for large wheels, and from nine to six inches apart for small wheels. These cleats are intended to serve as guides for a rule, so that measurements can be made with accuracy at right angles to the straight edge. Secure to the end of the hub a piece of paper on which the center of the hub is marked, and the circumference is divided into any number of equal parts. Then place the straight edge on the end of the hub, bringing a mark near its end to the center of the hub, and making its direction coincide with a division of the circumference. Measure the perpendicular distance from the straight edge to the surface of the blade, at each of the cleats; then move the straight edge to coincide with the next division of the circumference, and again take measurements. The arrangement is represented in the accompanying engraving, the circumference of the hub being



divided into thirty-two equal parts. Suppose that, in the position represented, the measurements from the straight edge to the blade, taken at each cleat, are each six inches. Then move the straight edge to the next position, and suppose that the measurements are each fourteen inches. This shows that the generatrix, in one thirty-second of a revolution, has advanced eight inches in an axial direction, consequently the pitch is thirty-two times as much, or twenty-one feet and four inches. If measurements taken at successive divisions of the circumference give a successive increase of eight inches for each division, it shows that the propeller is a true screw, with a pitch of twenty-one feet and four inches. Of course, if the pitch varies, it will be shown by the variation in the difference of the measurements taken at successive divisions of the circumference. It will be observed that the measurements made at one cleat in different positions of the straight edge give determination for the pitch at different

points of the same helix, and therefore show whether the pitch varies from forward to after part of the blade. The measurements taken at different cleats, in successive positions of the straight edge, show the pitch at corresponding points of different helices, and indicate whether the pitch varies from hub to periphery. The method here described is one of the simplest and most accurate that can be given for determining the pitch of a screw propeller. The other measurements, the diameter of the screw, length of blade, dimensions of hub, and fraction of pitch employed, are so simple as to need no explanation.

CRIME EPIDEMICS.

The discussion of Professor Huxley's views, developing the idea of "conscious mechanism" as explaining the various forms of human action, coupled with that of Dr. Hammond's theory of "morbid impulse," the kinship of which to the former hypothesis—indeed, the fact that it is but a corollary of the same—we have already pointed out, leads to some curious speculation relative to what extent the conscious machinery of one person may be set in motion, so to speak, by the activity of that of another individual. In other words, we are led to regard not merely the direct influence which one being exerts over another, through sentiments of respect, through intimidation, or through a score of other easily suggested conditions, but that indirect influence which is termed "force of example," that power which impels one man to do as another does, although the compelling cause of, (to illustrate) gain, revenge, or desire to benefit may be totally absent—irrational imitation, if we may use the term.

Abundant instances of this are to be found in the actions of the lower animals—sheep blindly following the bell wether, parrots imitating speech, monkeys repeating motions, and mocking birds sounds, and the inclination of the horse to race, will readily suggest themselves as cases in point. More striking still is the development of the peculiarity in children, shown not only in their learning to talk, but in their every action, even their plays being but endless imitation; and thus we are led up to the faculty in the man, which may impel him, with equal facility, to the commission of every crime in the decalogue, or to the re-writing of somebody else's poetry, after the fashion of the multiple only original authors of "Betsey and I are out," and "Beautiful Snow."

The serious aspect of the phenomena to which we allude, however, is one which those who make a science of the prevention of crime must eventually take into earnest and thoughtful consideration. It certainly is a fact that crime propagates itself by infection as surely as does disease. "There is a large class of minds," says Dr. Charles Elam, in "A Physician's Problems," on which great crimes exert a kind of fascination; and those who have never trained themselves to exercise the responsibilities of moral freedom are liable to become victims of the strongest delusions, and catch easily at the moral infection which is always lurking, and sometimes raging, in the atmosphere of the world." Nor need we seek long for illustration. The prevalence of the species of highway robbery known as garotting, in New York some years since, may be recalled, and the crime found plenty of imitators throughout the country. Not many months ago, murder appeared to be rife, and hardly a daily journal could be glanced over without the eye encountering horrible details of the killing of some human being. It is a suggestive fact that the last census, compiled when the Ring in this city was in the full tide of its power, and when such a thing as honesty was rarely to be found in the persons of the ruling men, shows a ratio of crime in New York State far ahead of that in any other State of the Union. Many will recall how common defalcations in banks and other institutions of trust have been during the last year or so, these crimes being, in the majority of cases, committed by men for whose action it was difficult even to assign a motive. Attempted frauds upon insurance companies have also found repeated occurrence of late; cases of suicide have happened, again and again, under conditions strangely similar; and thus we might go on, multiplying example after example.

The cause of this state of the mind, which renders it not only receptive to outside influence, but forces it to act in accordance with the same, is difficult to apprehend. If we attempt to trace a theory in accordance with Huxley's views, we must believe that the particles of brain matter are disarranged slightly by the individual's first impressions of the crime. A second impression causes more disarrangements, influencing, besides, those faculties which impel us to recoil from such subjects—causing a dulling of the sensibilities, or a familiarizing of one with the ghastly details; a third results in a still greater and similar effect, until finally the mechanism between brain and muscle is set in motion, and the person commits the deed. The theory leads to morbid impulse again, and, besides, to another class of actions, exemplified in the deliberate planning of the details of a defalcation, which, from the very period of time necessary for their development, preclude the idea of sudden or impulsive performance. Whether the reader may choose to adopt so material a view as this, or may cling to the opinion that the mental and moral forces of the body are only taken from our self-control by some intrinsically perceptible foreign agent, such as intemperance or connection through evil counsel, and hence flatly deny the primary principle that body and mind may be so constituted as to negative the efforts of the unfortunate person to obey moral and civil law, matters little in the face of the fact that the crime epidemic exist and social science must find a way to meet it.

We must look deeper, in short, for the causes of crime. If society makes murderers and thieves through its example, then should it punish them for its own misdeeds? Is the person who suggests the crime to be the avenger? Is a man amenable to punishment because his brain is beyond his control, under one theory, or because he has not the moral vigor to repel the crime disease, under the other? How is discrimination to be made, on the other hand, between him who wilfully and maliciously sins, and him who falls through cerebral weakness? If education is a safeguard—and it doubtless is, in great measure—against crime, then if society fails to compel its members to assume that protection, who should be punished for the neglect? These are perplexing questions, posed somewhat at random, it is true, but nevertheless the legitimate offspring of psychological fact, which leaves us without a doubt that prevention of crime is to be sought for rather than means for its cure. "It is very evident," says the last report of the New York Prison Association, now before us, "that society is wrong in its philosophy or practice, most likely in both. For if the theory be wrong, the practice is wrong. It is therefore clear that an intelligent application of remedies makes a knowledge of causes imperative. We have no well defined, accepted theories of the causes, degrees, and penalties for the violation of the civil code. Until we attain a true theory, our work must often blunder and often fail. How much is due to constitutional organization, and how much to the influence of society, we have failed to determine, because of our ignorance of causes."

THE COMMISSIONERSHIP OF PATENTS.

We learn that General M. D. Leggett, the present Commissioner of Patents, is about to resign the office, and that he is to be succeeded by the now assistant commissioner, the Hon. J. M. Thacher.

We much regret that the country is to lose the services of General Leggett, who has labored indefatigably, from the hour he took office, to improve the working of the department. For the most part, his labors have been crowned with success.

But some of his rulings and decisions have been variable and peculiar, especially on questions of patentable novelty. At times, he has pronounced the most broad and liberal opinions in respect to the rights of inventors to receive patents, but they have been followed by recantations or reversals of these opinions. For example, in the case of the applicant for a patent for a knitted tobacco pouch, package, or sack, that is to say, merely a section of a stocking leg, he held, on the appeal to him in person from the Board of Appeals, that the Board was in error in deciding adversely to the applicant, and ordered a patent to issue. He said: "That the sack, for the use contemplated, is a new and superior one is clear, and it is the object of the law to promote the production of new and improved articles, for the use of the public. Very little analogy appears between a stocking or purse and a sack for a tobacco package. The principles controlling the case were clearly stated by Justice Blatchford, in *Strong vs. Noble*"—whip case. After this clear and excellent decision, the applicant, having omitted payment of the second government fee, was obliged to renew his application, when the examiner again rejected the case, giving a new reference, similar in character to those previously presented, which had been overruled by the Commissioner. But General Leggett, instead of maintaining the excellent decision first given, now went back on himself, and denied the patent.

In the case of Professor Hedrick, so long and favorably known as examiner-in-chief of chemical inventions, whose established policy was to grant patents where the case by any possibility admitted of the grant, Commissioner Leggett long maintained and approved that policy. But he has lately gone back on Professor Hedrick, removed him from his original position, and substituted an examiner whose policy in granting patents is diametrically opposed to the practice of Professor H. The new examiner has made some very stupid decisions, which, if continued, will be very likely to give so much dissatisfaction as to cause his removal. Both commissioners and examiners at the Patent Office should remember that the chief object of their employment is to grant patents, not to reject them. They should study out every possible way to encourage and assist the inventor, and allow claims upon every possible point of novelty, however small. This is the true and reliable policy, and the only one that can give permanent or general satisfaction. It is far better to err in favor of the inventor than against him.

Should Mr. Thacher become the Commissioner, as we are led to expect, he will have an opportunity of carrying into practice some of the advanced views by him enunciated in his address before the Vienna Patent Congress last year. He there expounded the necessity of the most liberal practice in the grant of patents, and went so far as to declare that they were to be considered as the simple recognitions of that right of property in the productions of the mind, which God Almighty had himself bestowed upon man. We hope that, during Mr. Thacher's official term, he will see to it that no narrowminded examiner is suffered to remain who takes it upon himself to deprive an inventor of his heaven-born rights, no matter how small the degree of the invention.

The foregoing comments upon one branch of Commissioner Leggett's administration are not made by us in any spirit of fault-finding, but simply for the benefit of his successor in office, whoever that person may be. It can be justly said of Commissioner Leggett's administration that, as a whole, it has been a splendid one. He has been an honest and faithful officer. He has inaugurated many noble reforms, and he

will leave the Patent Office in a better condition of efficiency and usefulness than it ever before reached. At another time, we shall take occasion to particularize some of the many excellent improvements that are due to his assiduous labors. We will now mention but two of them, namely, the production of the weekly *Official Gazette*, and the printing of the patents in popular form. The successful inauguration of this last named enterprise is an honor of which General Leggett may well be proud, and it will always redound to his credit. It is a benefit to the country, of incalculable value.

INFLUENCE OF THE PRICE OF COAL ON SHIP BUILDING.

Of late years, the competition between steamers and sailing vessels has threatened to end in a losing struggle for existence on the part of the latter. The sudden jump in the price of coal in Great Britain, however, seems to have turned the tide once more in their favor.

The change is specially shown in the ship yards of the Clyde. In 1868, the number of sailing vessels built at this center of the trade was 108, aggregating 79,346 tons, against 100 steamers of 87,000 tons. In 1869, the sailing vessels numbered 104, of 89,150 tons, while the steamers were 96, of 85,600 tons. The next year, 1870, marks the beginning of the decadence in the building of sailing vessels, the number launched falling to 62, with a tonnage of 38,870 tons, the number of steam vessels rising to 121, of 133,000 tons.

The year 1871 showed a still further decline in the building of sailing vessels, the total being 25, of 12,720 tons, against 170 steamers of 180,000 tons.

In 1872, the tonnage of new sailing vessels fell to one fifteenth of that of the steamers, the ratio being 24, of 14,500 tons, to 161, of 215,000 tons.

Last year, the number of sailing vessels launched was about the same, but the ships were of a larger class, twelve being foreign trading vessels, and thirteen, small coasters; in all 25, aggregating 21,050 tons.

The price of coal went up toward the close of the year, and the effect on the character of the ships called for has been remarkable. The returns for the first six months of the current year (1874) show that of 93 vessels launched, 25, of 30,000 tons, were sailing vessels, and 68, of 99,500 tons, were steamers. In July, the launches were equal, 5 sailing vessels, of 6,800 tons, and 5 steamers, of 8,580 tons. Returns are also in hand for the first half of August, and show 6 sailing vessels, of 7,010 tons, against one small steamer, of 150 tons, for the coasting trade.

The sailing vessels for this year are thus four times greater in tonnage than for the corresponding period during the three preceding years, while the steam vessels show a decrease, during the same period, of 40,000 tons.

PECULIAR PEOPLE.

Consistency is a jewel. The orthodox journals of England have scarcely ceased to denounce the "prayer test" suggested by Dr. Thompson and introduced by Professor Tyndall, working themselves into a fever of pious horror at the bare suggestion of a doubt of the efficacy of prayer as a sanitary agent, when they join, with equal unanimity, in denouncing Baron Pigott for declining to condemn a man who sincerely trusted to prayer for the restoration of his sick child.

There is, in England, a religious sect calling themselves "the peculiar people," one of whose peculiarities is that, in a nation of Bible worshippers, they accept its teachings as their rule of life. Nothing can be plainer, for example, than the directions there given for the treatment of the sick—to call in the elders of the church and let them pray over him, anointing him with oil, "and the prayer of faith shall save the sick, and the Lord shall raise him up, and, if he have committed sins, they shall be forgiven him."

It is the practice of "the peculiar people" to follow these directions literally, much to the scandal of their pious neighbors, whose beliefs is tempered by a superior trust in the doctor.

A short time ago, the child of one Thomas Hines was taken sick. He was prayed over and anointed, and the Lord did not raise him up. At the coroner's inquest it was testified that the child was nursed with great tenderness and fed with the best of food; but no physician was called in, for which omission a verdict of culpable neglect was rendered, and the father was sent to the criminal court, to answer to the charge of manslaughter.

In view of the man's religious convictions and the fact that he had done everything for the good of the child according to his lights, the judge refused to let the case go to the jury. Against this decision the popular protest is loud and severe, the direst consequences being anticipated, if such literal applications of Scripture texts, by the ignorant and superstitious, are to be allowed.

It is instructive to turn over the files of the papers, now so indignant at the judge's ruling, and note the different tone of their utterances at the time when the efficacy of prayer was questioned. Then it was blasphemous to doubt the sure force of the believer's petition; now it is criminal to trust to it!

Has Dr. Thompson's proposition wrought its logical effect? Or are these would-be leaders of public opinion incompetent of feeling the force of logic?

The boiler of a thrashing machine engine lately exploded at St. Paul, Minn., killing three persons instantly, and injuring three others. One of the latter was blown 400 feet from the spot, and subsequently died.

MR. M. FLURSHEIM requests us to state that the length of the boiler mentioned in his letter (published on page 120, Vol XXXI.) should be 3 or 4 feet, and not $\frac{3}{4}$ foot, as printed.