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IMPROVED CURRENT WATER WHEEL.

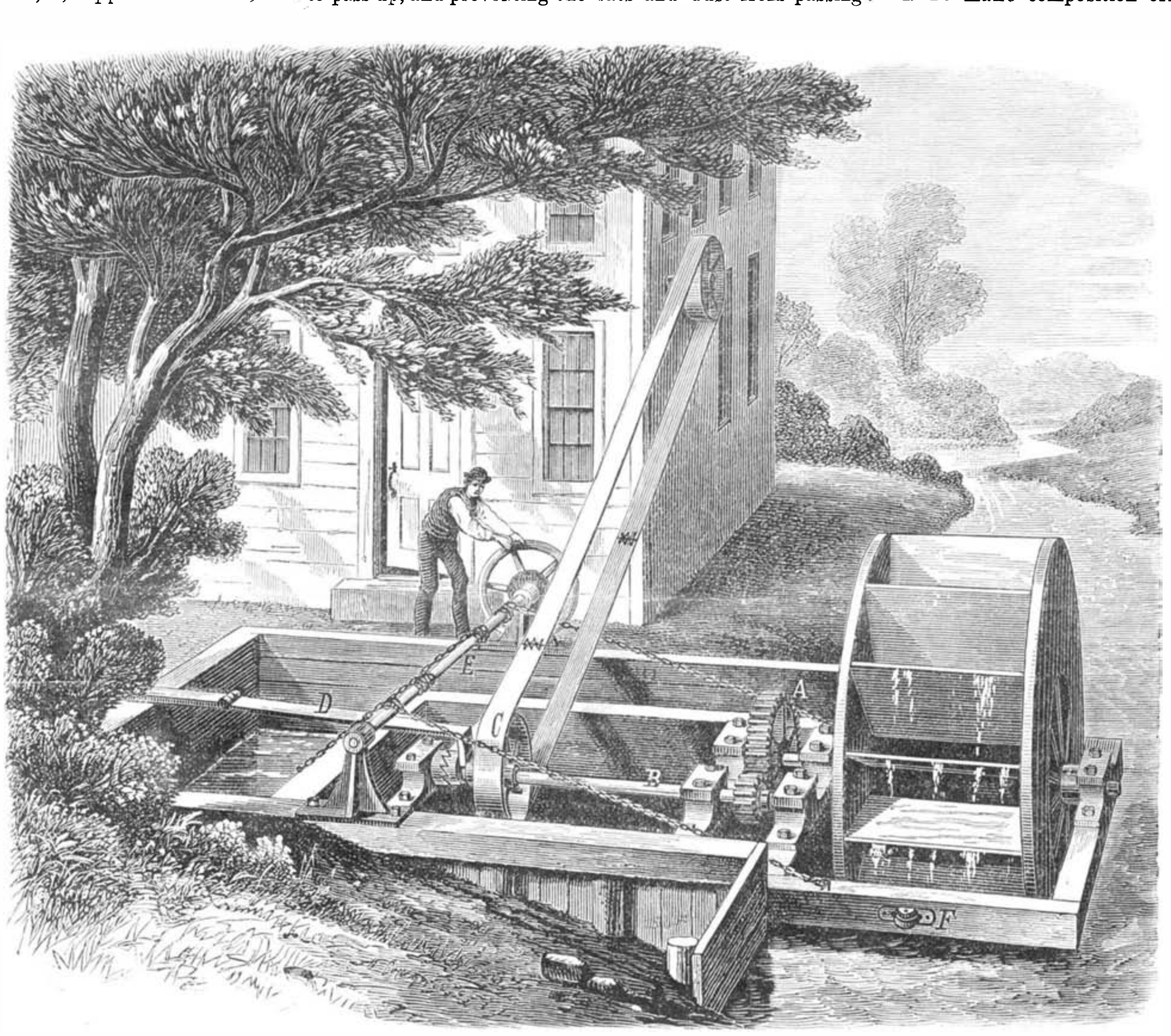
The invention illustrated in the annexed engraving is an undershot wheel, which is mounted in a float or raft. The latter is inclosed in a basin made by cutting away the bank at right angles to the stream, the sides being protected by piles and planking, or by stone revetments. The length of this slip is the same as that of the float, so that, if desired, the latter, with the wheel, can be carried back therein, and thus be removed out of the current. The raft is made of proper dimensions to balance the weight of the wheel, and the slip is excavated to a sufficient depth to float the apparatus at low water.

Our engraving shows the wheel projecting into the current and into operation. Its motion is communicated through gearing, A, to a horizontal shaft, B, supported in the middle portion of the raft. On this shaft slides a loose pulley, C, on the left hand side of the hub of which is an annular recess and a clutch, to engage it when desired with the shaft, B. In hub recess enters the end of a shipper lever, D, the other extremity of which is secured to the bank. A hinge in the middle of this lever allows of its adjusting itself to the position of the raft as the latter rises and falls with the varying level of the water.

It will be evident from the illustration that when the float is drawn into the slip for a certain distance, the lever, D, remaining rigid, will push the parts of the clutch asunder, so that such motion as the wheel may maintain will not be communicated to the loose pulley, nor through the latter, by the belt shown, to the point at which the power is to be utilized. On the other hand, however, when the raft is moved out so that the wheel enters the current, then the lever will draw the clutch into action and the power will be again transmitted; consequently the starting or stopping of the mechanism is readily governed by the means employed for moving the float, and this consists simply in a shaft, E, supported in suitable standards on each side of the slip, around which are wound chains leading to the opposite extremities of the raft. When this shaft is rotated, by the wheel shown in the hands of the figure to the left, the raft is necessarily drawn in; and when turned the other way, the opposite movement of the latter takes place. A pawl dropping into a recess in the shaft, E, holds the wheel in proper position when run out. Rollers, F, are attached to the longitudinal timbers of the raft to take against the planking of the basin, and thus to lessen the friction between the same and the raft, in moving the latter when the current forces it into close contact.

In streams which become swollen and choked with drift wood during the heavy rains and spring freshets, the device above described will prove of especial value, since the possibility of withdrawing the wheel entirely out of the current affords an excellent means of protecting it from injury or destruction.

Patented through the Scientific American Patent Agency, September 15, 1874. For further information address the inventor, Mr. Michael McCarty, Pueblo, Colorado.



McCARTY'S CURRENT WATER WHEEL.

Manufacture of Oatmeal.

The manufacture of oatmeal is beginning to attract the attention of many of the milling fraternity, both on account of the increasing demand for this wholesome article of food and the large profit in its manufacture. In Canada oatmeal is a common article of diet, but in the United States, though in considerable demand, comparatively little is known of its manufacture. Although the manufacture in this country is quite limited, the method is simple and inexpensive. But little information can be derived from those who are running oatmeal mills, simply because they desire to monopolize the trade to as great an extent as possible. After the outside hull and the stratum of down or fuzz covering the kernel are removed, the clean grain is ground into meal; and being deprived of its tough outer covering, care must be taken lest it be reduced to powder. The first and most expensive apparatus required is the kiln for drying or expelling the moisture from the grain until the kernel is hard and the hull stiff and rigid. The ordinary kiln is built of brick or stone, and so arranged as to distribute the heat equally under and around the drying floor. This floor consists of sheet iron or cast iron plates thickly perforated with funnel-shaped holes, the wide end downward, thus allowing the heat and smoke to pass up, and preventing the oats and dust from passing or choking the holes. The roof is constructed like an inverted hopper, with a square opening at the top for ventilation, and surmounted by a cupola with latticed sides. The oats, which are spread upon the kiln floor, are constantly stirred, to dissipate the moisture and prevent the lower strata from being scorched until the batch is sufficiently dried. In this way, from one hundred and fifty to six hundred bushels per day are kiln-dried, according to the capacity of the kiln.

Another style of kiln is also in use. This consists of two or more perforated sheet iron cylinders placed in the furnace one above the other, and so inclined that the oats gradually move from the higher to the lower end. The oats, after passing through the upper cylinder, are deposited into the upper end of the second, and from the lower end of the second into the upper end of the third, and so on; the number of cylinders, their length and velocity, being governed by the capacity required. This is, undoubtedly, much superior to the old style kiln, as it has a regular feed and dries the oats much more evenly and thoroughly. After the oats become cool, they are ready for shelling.

The stones best adapted for shelling are a coarse free sandstone, usually imported from England. The bedstone is faced perfectly true, but the runner has a bosom of about three sixteenths of an inch around the eye and running back to nothing at about two thirds of its diameter. The outer third is dressed to a true face corresponding to the bedstone. The faces are picked or roughened as for ordinary grinding, but have no furrows. The runner is set upon a stiff ryne, keyed to the spindle. The ryne has three or four arms which are let into open grains cut into the stone. The faces of the stones are not allowed to run very close to each other, being about a kernel's length apart. The duster and fan for removing the hulls and dust are simple and easily constructed. The grinding is sometimes done on the hulling stones, but it is generally advisable to use much smaller stones, furrowed, and having a smoother and much less grinding surface. The apparatus for bolting and sifting is very simple in construction, being a series of inclined sieves placed one above the other. These sieves are usually made of tin or zinc, into which are punched round holes of suitable size and sufficiently far apart to allow the hulls to slide over. The meal passes through these sieves while the bran passes over it at the lower end of each.—*American Miller.*

Composition for Picture Frames.

1. To make composition ornaments for picture frames: Boil 7 lbs. of the best glue in 7 half pints of water, melt 3 lbs. of white resin in 3 pints of raw linseed oil; when the ingredients are well boiled, put them into a large vessel and simmer them for half an hour, stirring the mixture and taking care that it does not boil over. When this is done, pour the mixture into a large quantity of whiting, previously rolled and sifted very fine, mix it to the consistence of dough, and it is ready for use.

2. Dissolve 1 lb. of glue in 1 gallon of water; in another kettle boil together 2 lbs. of resin, 1 gill of Venice turpentine, and 1 pint of linseed oil; mix together in one kettle, and continue to boil and stir them together till the water has evaporated from the other ingredients; then add finely pulverized whiting till the mass is brought to the consistence of soft putty. This composition will be hard when cold; but being warmed, it may be molded to any shape by carved stamps or prints, and the molded figures will soon become dry and hard, and will retain their shape and form permanently. Frames of either material are well suited for gilding.

Phosphorus and Phosphates in Putrefaction.

It has been shown by Pasteur and others that the presence of calcium phosphate accelerates the decomposition of gelatin and other animal matters, and they consider it is because the salt furnishes the necessary elements for the development of the sporules suspended in the air. These sporules fix themselves upon moist surfaces, and by producing mucidinea and microzymes accelerate decomposition of animal matters. Animal secretions, such as urine, which naturally contain a considerable quantity of calcium phosphate, do not putrefy more quickly by the addition of calcium phosphate, because they naturally contain enough of the salt to nourish the microzymes developed by means of the albuminous substances. Flesh which contains much calcium phosphate decomposes more rapidly than that which contains less, or in which the phosphoric acid is combined with an alkali. It is well known that the flesh of fishes alters more quickly than butcher's meat. According to Von Bibra, the ash of perch and carp yields 44·34 and 42·20 per cent of earthy phosphates, while the ash of beef and veal furnishes only 20·60 and 16·40 per cent; but, on the contrary, the latter are one third richer in alkaline phosphates than the former.

The muscular flesh of sea fish and mammalia contains the following percentages of phosphoric acid: Skate, 0·514 mackerel, 0·532; beef (fillet), 0·395; veal (ditto), 0 374; pork (ditto), 0·430. The animal ferment, like the vegetable ferment, has then an indispensable want of earthy phosphates, and especially of calcium phosphate, for its multiplication, and this want is so strong that the microzymes attack the most insoluble phosphates. Flesh begins first to putrefy in the part nearest to the bones.—*J. Lefort.*

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(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC TREATMENT OF CRIMINALS.

The *Tribune* is alarmed at the logical consequences of the mechanical theory of life, seeing in them not only the downfall of theological dogmas, but the subversion of our entire criminal jurisprudence. If we are to push to ultimate conclusions the theory that the acts of the lower animals are purely automatic, it argues, we shall be confronted immediately by the extension of that theory, demanded by the similar anatomy of man. This point yielded, we are brought face to face with the problem presented in the case of the wounded French soldier, who is scrupulously honest when the sound part of his brain is acting, but, when under the influence of its impaired portion, is an inveterate thief.

For example: "A prisoner, brought before a court of justice for assault, might admit that he struck the blow, but allege that the act was simply [the mechanical effect of] a piece of 'unconscious cerebration.' An insult from the man he struck called forth the blow in return, by reflex nervous action. His will bore no more part in the matter than would the winking of his eyelids if something suddenly approached his eyes. Certainly," concludes the *Tribune*, "no court would at present accept such a plea; but is it utterly at variance with scientific teachings?"

The *Tribune* apparently sees in this a fatal objection to the automatic theory. Perhaps it may be rather a fatal objection to the present constitution of the court—a proof that the current theory of criminal jurisprudence is altogether wrong.

Suppose the plea of the hypothetical prisoner to be admitted: nay, further, let the prisoner assert that the assault was due to *conscious* cerebration—in other words, that he knew precisely what he was doing and why he did it. Let his plea be that, owing to the structure of his physical and mental machinery, the alleged insult was a sufficient cause—an irresistible cause, if you will—of the muscular action in which the assault culminated: in other human machines the effect might be different; but for him he could not do otherwise, and he ought not to be punished for what he could not help.

Suppose, we say, that such a plea is accepted as cogent. Would the foundation of justice be undermined, and the stability of the social order destroyed? The *Tribune* would undoubtedly reply with an emphatic affirmative. A thoroughgoing scientist might claim, on the contrary, that, until such a plea can be accepted as valid, a rational judicial system is impossible; that, not until criminals are recognized as badly working, yet not wholly useless, machines, will it be possible to treat them with impartial and passionless justice, rendering justice at the same time to the well behaved.

Our present manner—we cannot call it method—of dealing with offenders against the commonwealth is an irregular inheritance of vengeance, intimidation, sentimentality, superstition, brutality, and party politics. Feeling for or against the criminal marks every stage of our treatment of him. We execrate him and pray over him. We shut him up in an unwholesome cell and give him a Bible. We drag him to the gallows between two clergymen and dispatch him with a passport to eternal bliss. From first to last, he is held responsible for the conditions of his birth and education, the structure of his body, and the constitution of his mind. He is born a thief and a liar, and is alone held to blame for it. His judgment is weak and his passions strong; his mind is uncultured and his tastes depraved by vicious surroundings in infancy and youth; yet we pursue his perverted course as vindictively as if he were free to choose the right at every stage of his career. We imagine that to punish him will satisfy the fetich called law and justice, will prevent others from doing the same things, and possibly, by some miracle, may make a different and better creature of him. That our criminal proceedings accomplish none of these things effectually is only too apparent; and they add to this failure the fault of being grievously burdensome to the well doing. For our part, we see no path out of this tangle of contradiction and injustice so clear as that opened up by the mechanical theory of human action.

From this point of view, the plea of our imaginary criminal would be respectfully heard. Then the judge might say: "The court is sorry that your organism is so viciously constructed, since it therefore becomes necessary for the community, in self-defense, to take it in charge. Have you ever learned a trade?"

The prisoner replies in the negative, and the judge continues: "That is to be regretted, since it makes it the harder for you to square your account with society. You will proceed to the public works, to perform such labor there as you may be found competent to do, under such restrictions as may be needful in your case. The man you struck has lost, in consequence, three days' time, for which we allow him so many dollars. The fee of the officer who took you into custody is so much. The cost of this court, so much. The expense of your keeping while under arrest has been deducted from your daily earnings. Your indebtedness to society is therefore so many dollars. This will be paid from the amount you may be able to earn at hard labor, after paying therefrom the cost of your keeping and what may be required for the support of those dependent upon you. This done, you will be set at liberty at such time as, by your conduct, you shall have demonstrated that your mental and physical machinery is in trusty working order. May your cure be speedy and effectual!"

But, it may be objected, all crimes are not of this simple character; the robber, the incendiary, or the murderer deserves punishment, while a lifetime of hard labor may be inadequate to make good the damage he has done.

Shall we therefore throw away all the possibilities of profit which his organism involves? Because a locomotive jumps the track and wrecks a train or kills a passenger, do we add to the loss by smashing the engine? There may be states of society in which the most profitable way to deal with disturbers of the peace is to kill them in the most summary manner; but in a working community, where every man's strength is needed, such a course is the reverse of economical.

The murderer is simply a bit of mechanism, not sufficiently well adjusted to be self-regulating. Left to itself, it works mischief; but, under proper supervision, it can do much that needs to be done. It is sheer folly to destroy it or lock it away to rust in idleness.

As for the deterring effect of the treatment of criminals upon those approaching criminality, we should certainly trust to the resistless, passionless logic of the scheme we have suggested, quite as much as to the uncertain and illogical disposition we now make of them. Impress the evil minded with the fact that it is easier and pleasanter to earn an honest living out of prison than in it: in other words, that crime does not pay, and will not pay them, and the great motive for wrong-doing will be gone. Make the criminal class self-supporting, and not only will a great burden be lifted from the shoulders of the virtuous, but crime will cease to be the refuge of the lazy.

For the reformation of criminals, there is demonstrably nothing more effectual than habits of industry, sobriety, and respect for the rights of others, which are not, but should be, the great lessons of the prison school. Further, when the prisoner is made to feel that his loss of freedom and privation of comfort are not intended as punishment, but as a social precaution, that he is regulated by others, simply because he has shown himself incompetent of self regulation, and that his return to liberty, full or partial, is conditioned solely on the payment of his obligations and the assurance of society that he is fit to be trusted with himself, the highest possible incentives will be offered for his genuine reformation, which, next to its own protection, is the chief object society should have in its exceptional treatment of him.

HUXLEY'S THEORY OF MAN.

There is nothing so easy as to forget. Just now half the world is discussing as a new theme the logical tendency of Professor Huxley's latest utterance, or speculating as to the grounds of his declining to accept the conclusion that man is nothing but a machine, after demonstrating that animals are simply conscious automata and admitting that the view thus taken of the relations between the physical and mental faculties of brutes applies in its fullness and entirety to man. Yet it is but a little while since Professor Huxley went over this matter from the beginning, developing his position with a thoroughness which ought not to be forgotten after the fierce discussion it aroused.

The inseparable connection of matter and life is a fact of every day experience. Whatever the spiritualists may claim, Science has no knowledge of bodiless living beings. The inseparable connection of life and a particular combination of matter was demonstrated by Professor Huxley in the celebrated "Lay Sermon" on the physical basis of life (first delivered in Edinburgh one Sunday in November, 1868) by a line of argument substantially as follows:

The four elements never absent from living matter are carbon, hydrogen, oxygen, and nitrogen. Carbon and oxygen unite in certain proportions and under certain conditions to give rise to carbonic acid; hydrogen and oxygen produce water, and ammonia is the product of nitrogen and hydrogen. These several compounds, like the elements of which they are composed, are lifeless. But when they are brought together under certain conditions, they give rise to the still more complex body called protoplasm, which exhibits the phenomena of life, and which is found to be the formal basis of all life. From the elements to protoplasm there is a series of steps in molecular complication, a series showing no discernible break; and there is no good reason why the language which is applicable to any one term of the series may not be applied to any of the others.

We think fit to call different kinds of matter carbon, oxygen, hydrogen, and nitrogen, and to speak of the various powers and activities of these substances as the properties of the matter of which they are composed.

When an electric spark is passed through a mixture of hydrogen and oxygen in certain quantities, the elements disappear, and a quantity of water, equal in weight to the sum of their weights, is found in their place. There is not the slightest parity between the passive and active powers of water, and those of the hydrogen and oxygen which have given rise to it. Nevertheless, we call the phenomena exhibited by water the properties of water, and do not hesitate to believe that in some way or other they result from the properties of its component elements. We do not assume that something called "aquosity" enters into and takes possession of the oxide of hydrogen as soon as it is formed, to guide the aqueous particles to their place in the facets of an ice crystal, or among the leaflets of the frosty imitations of vegetable foliage which we see on our window panes in cold weather.

Is the case changed in any way when carbonic acid, water, and ammonia disappear, and in their place an equivalent weight of the matter of life makes its appearance?

What justification is there for the assumption of the existence in the living matter of something which has no representative or correlation in the not living matter which gave rise to it? What better philosophical status has "vitality" than "aquosity"?

Further, if the phenomena exhibited by water are its properties, so are those presented by protoplasm, living or dead, its properties. If the properties of water may be said to result from the matter and disposition of its component molecules, there is no intelligible ground for refusing to say that the properties of protoplasm result, from the nature and disposition of its molecules.

But having shown in another connection that protoplasm is the common basis of life, Professor Huxley sees no logical halting place between the admission that the properties of protoplasm are the result of the nature of the matter of which it is composed, and the concession that the highest manifestations of life are equally the expression of molecular changes. "As surely as every future grows out of past and present, so will the physiology of the future gradually extend the realm of matter until it is coextensive with knowledge, with feeling, with action." With equal confidence he predicts that we shall, sooner or later, arrive at the mechanical equivalent of that most metaphysical of phenomena, consciousness, just as we have arrived at the mechanical equivalent of heat.

Does this land him in materialism? He avers not, and takes pains to say that he reprobates the fundamental doctrines of materialism as he does the most baseless of theological dogmas, believing, with Hume, that they, like the fundamental doctrines of spiritualism and most other "isms," lie outside the limits of philosophical inquiry. The materialistic aspect of these matters has had an immense and a most beneficial influence upon physiology and psychology. And he shows, in the discussion of the philosophy of Descartes, that he is prepared to go with the materialists to the extent of holding that the human body, like all living bodies, is a machine, all the operations of which will some time be explained on physical principles; but when they declare that man is nothing but a machine, they go farther than he thinks they have any right to. Most emphatically does he decline to follow them in the assertion that the Universe is nothing but matter, and force, and necessary laws. Here he sides with the idealists, considering "matter" and "force" to be, so far as we know, mere names for certain forms of consciousness. "If I say that impenetrability is a property of matter, all that I can really mean is that the consciousness I call extension, and the consciousness I call resistance, constantly accompany each other. Why and how they are thus related is a mystery. And if I say that thought is a property of matter, all that I can mean is that, actually or possibly, the consciousness of extension and that of resistance accompany all other sorts of consciousness. But as in the former case, why they are thus associated is an insoluble mystery."

In all this no account is taken of what by many is deemed the essential factor of humanity—the soul.

While Professor Huxley evidently frames his definition of man so as to leave room for the introduction of this hypothetical element, if any one feels so disposed, it is clear that he regards its existence and influence somewhat as questions of "lunar politics"—questions which neither he nor any one else has any means of determining, and in the discussion of which he has no time to waste. Seeing that matter and spirit—which are but names for the imaginary substrata of groups of natural phenomena—lose themselves in each other in ultimate analysis, what is the use of wrangling over them while there is so much honest work to be done in the world?

"In itself," he says in the "Lay Sermon" first referred to, "it is a matter of little moment whether we express the phenomena of matter in terms of spirit, or the phenomena of spirit in terms of matter: matter may be regarded as a form of thought, thought may be regarded as a property of matter; each statement has a certain relative truth. But with a view to the progress of Science, the materialistic terminology is in every way to be preferred: for it connects thought with the other phenomena of the Universe, and suggests inquiry into the nature of those physical conditions and concomitants of thought which are more or less accessible to us, and a knowledge of which may in future help us to exercise the same kind of control over the world of thought as we already possess in respect of the material world; whereas the alternative, or spiritualistic, terminology is utterly barren, and leads to nothing but obscurity and confusion of ideas."

ALCOHOL, FOOD, AND FORCE.

We had supposed that Liebig's notion of the relation between food and force had been generally repudiated by scientific physiologists; but its appearance as a stumbling block in the recent discussion of the action of alcohol in the human system, by the Neurological Society, seems to show that it is not yet permanently set aside in all circles presumably scientific. Indeed it was never more emphatically enunciated than in the inaugural address of the newly elected president.

"We know," said Dr. Hammond, "that a certain amount of tissue is decomposed with every functional activity of the organ to which it belongs. Just as steam results from the combustion of fuel, so thought results from the combustion of gray nerve tissue, motion from the combustion of muscle, and the power to secrete bile from the substance of the liver. We know very well that, if fresh fuel be not supplied to the engine from time to time, steam ceases to be formed, and the machine set in motion by it no longer works. The like is true of the body; and were it not for the formative processes which are continually going on, whereby new material derived from the food is deposited to take the place of that which is consumed, death would very soon result. It must be distinctly understood, however, that ordinary food does not directly furnish any force inherent in the body, but that it must first be converted into flesh and brain and heart and liver, etc., from the destruction of which the force peculiar to each is evolved.

In restricting the theory to "ordinary food," Dr. Hammond evidently had in mind the extraordinary action of alcohol, which, according to his own showing, does furnish force to the body without first forming tissue, and—more perversely still—while it retards the process of tissue consumption by which alone, according to the theory, force can be evolved.

The experiments establishing this point are narrated at length in the address, as published in the *Psychological Journal*. A given amount of food *plus* a moderate dose of alcohol appears to enable one to do more work, without drawing upon the reserved forces of the body, than can be done on the food alone; or, when food and work remain constant, and so adjusted as to keep the body at a fixed weight, the addition of a small portion of alcohol to each meal is followed by a gain in weight. Similarly, if the weight of the body be increasing, the gain will be augmented, if losing, the loss will be diminished, when alcohol is taken, other conditions remaining unchanged.

This conflict between theory and observation is fairly faced. By the theory, alcohol, which does not form tissue, ought not to supply force to the system; by stopping the destruction of tissue, it ought to diminish the available force of the system. But the experiments show that, properly administered, it does increase the working force of food, both physical and intellectual. That the force thus developed under the use of alcohol is directly supplied by it, Dr. Hammond is certain. How it does it, he cannot see.

From first to last, indeed, the Society seems to have stumbled over Liebig's teachings; and curiously there was no one present sufficiently familiar with recent physiological research to challenge the theory and accept the facts as not inconsistent with known effects of food.

It is nearly thirty years since the death-in-life doctrine of force from tissue combustion was questioned by Dr. Mayer of Heilbronn, then an obscure country physician, now honored the world over as one of the first to propound the greatest generalization of modern Science, the correlation and conservation of force. More recently, Fick and Wislicenus, Dr. Edward Smith, Mr. Heaton, Professor Haughton, and others have demonstrated its baselessness by elaborate investigations showing that the waste of tissue is not proportionate to work done; while, save in cases of starvation, it is altogether inadequate to account for the forces evolved. Under normal conditions the larger part of the force required to maintain the body's temperature, to keep up the processes of thought, digestion, respiration, and other vital functions, and to perform the various sorts of external work demanded of the muscles, is shown by these investigations to be derived directly from the blood, or more precisely, from the food which the blood carries to the several organs.

The wonder is, not that the contrary view should have been entertained so long, but that it should ever have been accepted. An engine working in the manner thus attributed to the human system—first using its fuel to build up its parts, then burning up its own substance to develope power—would have been pronounced absurd by the most superficial observer. The fact, that it was, within certain limits, self-repairing, would not have made its mode of developing force in the slightest degree more economical; though it might help to hide its foolishness, as it seems to have done in the supposed case of our bodies.

If, from this point of view, we were to develope Dr. Hammond's comparison of the body to a steam engine, we should have to regard the organs, by means of which intellectual and mechanical work is done, as parts of a complete mechanism, capable of developing and transmitting the forces evolved by the decomposition of the food conveyed by the blood, just as the steam engine developes and transmits the power arising from the combustion of fuel. The work done in either case is proportioned, not to the loss of substance experienced by the machinery employed, but to that available in the food in the one case, in the fuel in the other.

True, as Professor Haughton observes, the same blood, which, by its chemical changes, produces movement and thought, also repairs the necessary waste of muscles and brain by means of which movement and thought are possible; just as if the steam that works an engine were able, without the aid of the engineer, to repair the wear and tear of its friction and waste spontaneously. "But no greater mistake is possible in physiology than to suppose that the products in the changes of the blood, by means of which mechanical and intellectual work is done, are themselves the result of the waste of the organs, whether muscles or brain, on the exercise of which that work depends."

Having thus a clear conception of the function of food in the animal economy, it is easy to see that alcohol, though not a tissue-forming substance, may nevertheless, under proper conditions, add directly to the working force of the system. The fact that, when taken in moderate doses, it disappears in the system as completely as beef or bread, lends probability to the opinion that it is a force supplier. How far it is a useful and profitable adjunct of food is another matter.

BULLS ON THE TRACK.

Horace Greeley used to compare people, whose opposition to the normal progress of events was more zealous than discreet, to a plucky but shortsighted bull that tried one day to stop a railway train to Chappaqua. The result was disastrous—chiefly to the bull. Had the honest old gentleman lived to witness the revolt of the Wisconsin farmers against the social and material prosperity of their State, he would have found in their bovine attempts a striking and very pertinent occasion for recalling the comparison.

From a higher point of view, the action of the farmer class affords a perfect though costly illustration of the inability of human kind to profit by the fate of others, men as well as bulls. It furnishes also one more proof of the law of human development, that all societies proceed from barbarism upward along practically the same course, marked by the same characteristic stages, which may be more or less rapidly passed over, but which can never be altogether avoided.

One of the earliest steps which men take toward social improvement is that of combination. Unfortunately, however, first combinations among men are always for offensive ends, and are always destructive in their reaction. The first gang of prehistoric savages who ever put their shoulders in line for a common purpose doubtless had in view the wiping out of encroaching neighbors; a more enlightened self interest would have taught them that, in their severe struggle with the forces of Nature, not war, but friendly alliance, with all other men was the better policy. The same suicidal tendency crops out continually in the history of human progress. Nations spend ages—and their own manhood as well—in destructive wrangling, to discover at last that friendship and mutual helpfulness would have been infinitely better for both sides. And as with nations, so with the integral parts of nations. Each class must learn its wisdom by independent experience.

When the mechanic classes first reached the combining stage of development, they straightway declared war against capital, against machinery, against rival labor, against the inevitable, generally. Gradually, through bitter disappointment and loss and suffering, the more intelligent are learning that the wiser course is to form closer and more amicable alliances with all productive interests, especially with the men without whose money and organizing ability their own exertions would be prevented or rendered profitless.

The farmers' turn has come now, and they seem bent on going through the same unsatisfactory mill. They have discovered that there is strength in union, for them as for others; but they—at least those of Wisconsin—have not learned that it is madness to use their strength in overturning the corner stone of their own prosperity. It may be hopeless to expect them to profit much by the dear-bought wisdom of the classes which have preceded them along the same line of intellectual and moral development; nevertheless it is safe to predict that it will not take them many years to learn that the "independent farmer" in these days does not stand alone in the world; that his interests are inextricably blended with the interests of others, even those of the obnoxious railway magnate; and that in the long run a general regard for the Golden Rule will not seriously conflict with the advancement of agriculture.

Descending from general principles to special facts, it might be instructive to the Wisconsin farmers to give an impartial thought to the relation which the railroads bear to their present condition, to consider seriously their indebtedness to these enterprises, and to speculate a little in regard to the retroactive effect on their own prosperity, likely to result from the pressure they have brought to bear on these arteries of civilization.

The Providence which causes great rivers to flow by great towns for the advancement of commerce is seen not less clearly in the distribution of railways—particularly in the West. As a rule they have led the way, while population, and all that population brings, has followed after. Without them, except perhaps along the water courses, the country would have been to-day a wilderness. Contrast the rapid growth of Wisconsin with the slow development of States, in the days before the T-rail (with a dash) began to supersede the Indian trail; States which, like New York, were blessed with infinitely superior natural advantages, both from position on the coast and because of their facilities for internal communication by water. Or contrast those parts of Wisconsin which railways traverse with those which know them not; and it may be possible to estimate vaguely the influence which railways have had on the State's development.

In 1850—two years after Wisconsin became a State—the census takers found a population of 305,000, or 6 to the square mile. There were then three "railway men" in the State, and forty thousand farmers, with improved lands amounting to one million acres, and above the same number of acres unimproved, the average value of both together being less than ten dollars an acre. The aggregate wealth of the State in real and personal property was $42,000,000, or less than $140 a head. In 1870 the number of persons engaged in agricultural work in the State was 160,000, of whom 109,000 reported themselves as farmers and planters. The aggregate population exceeded 1,055,000, or 20 to the square mile. The value of the farms, now showing nearly six million acres of improved lands, had increased in amount from less than $30,000,000 in 1850 to over $300,000,000 in 1870. From less than ten dollars an acre, the average value of the farm land, improved and unimproved, had increased to more than twenty-five dollars an acre; while the aggregate wealth of the State had swelled to $700,000,000 and over, or an average of $665 to each individual. In the mean time the three railway men of 1850 had multiplied a thousand fold, and 1,525 miles of railways had been constructed.

We should like to see an honest Granger's estimate of how much of this enormous increase in wealth and population has been—we will not say produced, but—made possible by the railways which have been so oppressive (?) to farmers, while they have brought, in towns and cities, manufactories and markets, without all which the richest farmer in Wisconsin would, we fancy, find little encouragement in his work.

Have the millions invested in railways brought a corresponding reward to those who furnished them? In justice, they should; in reality, they have but little more than held their own. This result was not unexpected. In sparsely settled countries railroads are built, not for present but for future profit. If for years they pay their current expenses, they do well. It is only after the country has become thickly settled, and the connected points important, that they can hope for profits commensurate with those of other branches of industry. That the roads affected by the Potter law, namely, the Chicago and Northwestern, and the Chicago, Milwaukee, and St. Paul, have never yet been able to earn a fair income on the capital invested, is well known. At such a stage, to have their receipts arbitrarily cut down 25 per cent is, to say the least, not encouraging to such enterprizes, or calculated to impress the stockholders with a high appreciation of bucolic wisdom and honesty.

By skillful management, and with a great reduction of working expenses, the companies may be able, with the help of through traffic, to sustain themselves and pay the interest on their bonds; but the outlook is not encouraging. Already a large amount of rolling stock has been withdrawn; the speed of trains will have to be reduced, and second class coaches substituted for first class. Whether the through traffic can be retained in connection with the new arrangements remains to be seen. It is more than likely that it will be largely diverted to lines running through other States.

If the farmers only were to suffer the reflex consequences of this sudden set-back of the progress of their State, there would be fewer to deplore it. But they will not; nor will they be the first to feel it. The mercantile, manufacturing, and lumbering interests may be prostrated before the farmers begin to discover the mischief they have wrought—assuming, of course, that the United States Court affirms the validity of the law, and it remains unrepealed; but the penalty will be none the less certain because delayed. The farmers have been chiefly benefited by the rapid development of the country; by arresting its development, they will ultimately be the heaviest losers.

New Postal System.

On January 1, a new law is to take effect, requiring the prepayment of postage by the publishers on all newspapers and magazines mailed to subscribers. The result will be to increase the postal revenue by insuring the payment of postage on all publications; and it is believed that the system will prove a convenience to subscribers.

Instead of the subscriber being required to pay any postage to the office where he receives his paper, it will be delivered to him free, and the publisher will include the postage in his subscription rates.

IN an ordinary open fire grate, 75 per cent of the heat, resulting from the combustion of the fuel, goes up chimney and is wasted, only 25 per cent being radiated into the apartment.

FURNACE FOR THE LARGE HAMMER AT WOOLWICH ENGLAND.

We have already described the 35 tun steam hammer, re cently erected at Woolwich, England, for use in the Royal Gun Factories; and we present herewith an engraving of a reverberatory furnace (one of two) of unprecedented size, to be used in heating the coils of which the ponderous ordnance is built up. The furnaces are built upon a block of concrete 4 feet thick, laid in an excavation dug out for it, and having large slabs of cast iron placed upon the top, so as to distri bute the pressure evenly throughout the whole mass. Upon these slabs a series of cast iron standards is erected for the floor of the furnace to rest on, four rows of standards being beneath the hearth, where, of course, the greatest weight, that of the "heat," comes. The hearth has four strong cast iron girders around it, forming a square frame above the standards; and the bottom of the hearth consists of thick cast iron slabs. It is sunk about one foot, so as to admit of a deep bed of fettling being formed within it upon the iron slabs. Girders also run along the sides of the furnace floor for the wall plates and brick side linings to be built on. These girders rest upon the standards before alluded to. The end walls are built upon large cast iron cross beams, which are perforated transversely with holes and grooved longitudinally to prevent their twisting and buckling with the heat. The two side walls of the furnace, and one end wall—that over the fireplace—are constructed externally of light plates of cast iron, as shown in the engraving (for which we are indebted to *The Engineer*), with flanges at the edges to connect them, and ribbed on the outside for strength. They are cast with large apertures in the plates between the ribs. A large circular aperture is contrived on the side opposite the door, which is ordinarily filled with a wall of fire bricks, but could be opened in emergency to introduce a long heat, required to be welded in the center. The plates are generally connected at the flanges by means of keys, wedges being driven into slots cut in the keys on one side. Where there is no room for driving the wedges, such as at the sides and lintel of the doorway, where there is a double flange, bolts and nuts are employed. Within the walls of plates the lining of fire brick is built, and it is bonded here and there into the apertures of the plates to keep it in position, as, except at the ends, it is very thin. The bricks are all headers. The brick ends of the furnace are, of course, arched over, and meet in the center to form the roof. The side walls are prevented from separating by stout wrought iron bars, square in section, running across at the top and floor from outside to outside, which are keyed in a similar way to the flanges of the plates, with wedges passing through slots in the bars on either flank of the plates.

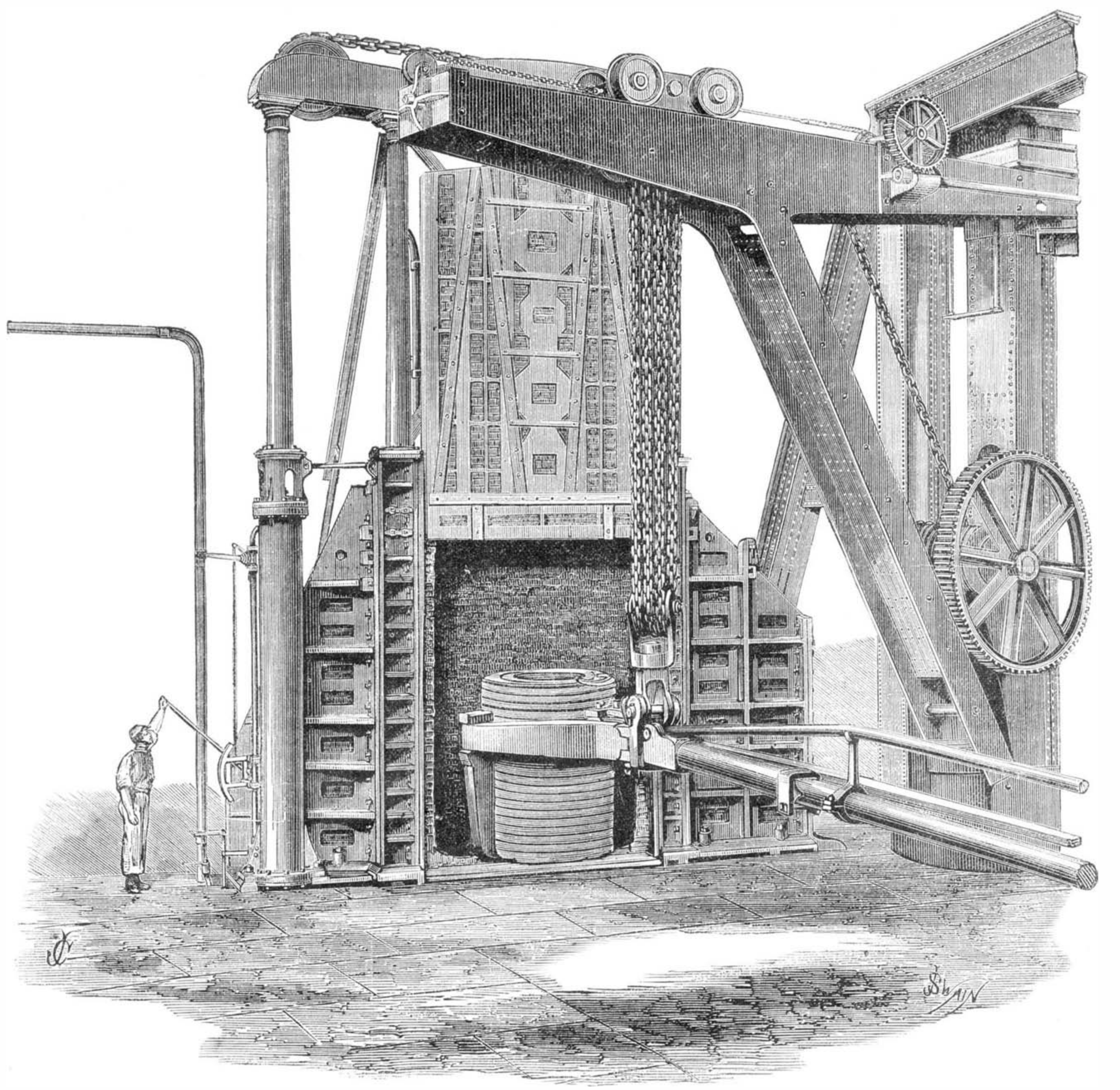
The flue leading to the chimney stack is supported upon plates and perforated beams; thus every facility is afforded for the free passage of a current of air around, above, and beneath the entire furnace, so that the exterior of it may be kept as cool as possible. This is essential for the preservation of the furnace and to prevent radiation, the lightness of its construction enabling an intense heat to be generated inside while the exterior is not affected by the temperature; at the same time, expansion and contraction may take place with impunity. Internally the furnace consists of three parts, the fire chamber, the hearth, and the flue leading away to the chimney. The first two of these are separated from each other by a low wall of fire bricks to throw the fire upwards and over the top of the heat. The fireplace is of the ordinary character, the fire being built upon trapezoidal bars. It is fed through two apertures in the iron and brick end walls. The hearth, which has already been described, has a channel beneath, on one side, for the slag to run off as it is formed. This is collected in molds in a pit behind the furnace, and afterwards hoisted up by a small hand crane for removal. The flue and chimney stack present no new features. The door of the furnace and the means for lifting it are novel. It consists merely of a cast iron frame filled in with fire bricks, and is bound together with bands of wrought iron, as shown in the engraving. It weighs 8¼ tuns. In order to lift this heavy weight, a massive chain, passing over two pulleys suspended to a girder above, has a counter weight attached to it weighing 7½ tuns, which sinks into a well in the ground as the door ascends. As, however, this counter weight would not of itself be sufficient, and in order to overcome friction between the chain and the counter weight, a long cylinder is contrived, to the piston rod of which the chain is attached. When it is required to raise the door, steam is admitted above the piston, which descends, the counter weight accelerating its movements. The door in closing, is sufficiently heavy to raise the counter weight and is given a slight excess of weight for this purpose over the latter.

A Case of Fragile Bones.

A correspondent, Mr. Z P. M. King, says: "I noticed your account of a remarkable woman without bones. My wife once witnessed a case in Lodi, Wis., which bears some analogy to it. The bones of a child, 2½ or 3 years old, seemed to be of such tender nature as to be in danger of breaking every time it was moved. The limbs had been broken repeatedly in attempting to lift it, so it was carried on a pillow exclusively. The child had not outgrown the size of an infant 9 months of age. The bones seem to knit readily, but broke in another place as soon as the child was lifted."

The National Board of Fire Underwriters.

At a meeting of the Executive Committee of this body, held on September 23, it was resolved that, the authorities of Chicago having failed to comply with the suggestions put forth by the National Board of Fire Underwriters on the 24th of July last, "this committee now recommends that all companies belonging to the National Board discontinue the business of Fire Insurance in the city of Chicago, either by new policies or renewals, on and after October 1, 1874; and that the General Agent be instructed to communicate this decision at once to all National Board Companies for immediate action." The committee is advised that the board companies will carry out the above recommendation with great unanimity.



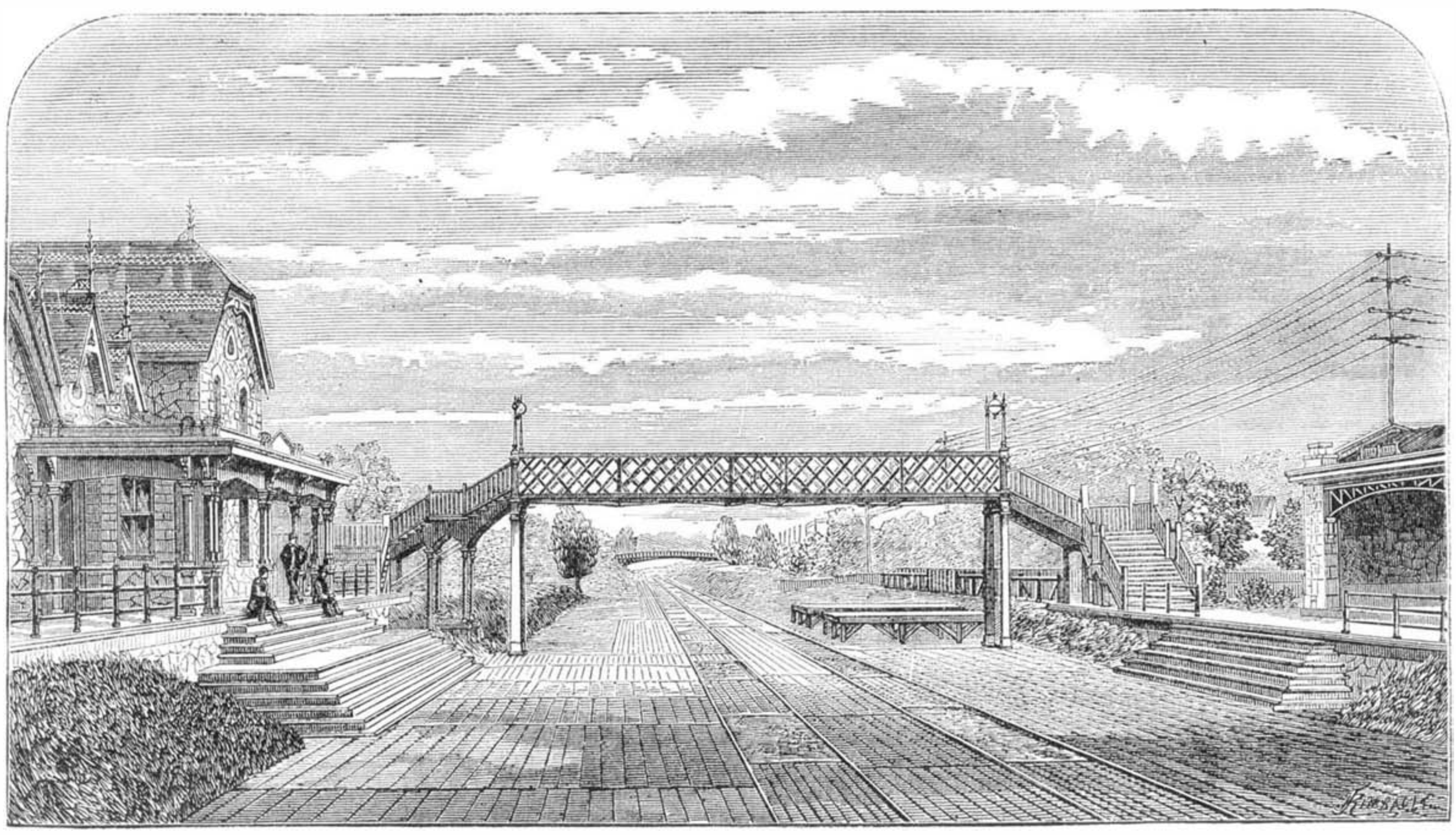
HEATING FURNACE FOR THE MONSTER HAMMER, WOOLWICH, ENGLAND

AMERICAN RAILROAD STATIONS.

Since the civil war, progress in the United States has been rapid and vigorous in all directions, but in no department has this been more marked than in railroads. The main lines or arteries throughout the country are becoming every day more substantial; and their permanent way, stations, warehouses, shops, etc., are rapidly assuming the solid appearance that we see on English and Continental roads. No road stands higher in this respect than the Pennsylvania Railroad; in fact, it has always maintained a prëeminent reputation in matters of this kind, with its iron bridges, its solid ballasted track, steel rails, and fine shops.

We publish an engraving herewith, taken from *Engineering*, of a passenger station erected recently on this line, at Bryn Mawr, eight miles from Philadelphia, a portion of the country thronged with summer residences and country seats of wealthy Philadelphians. It is only a sample of a number of others on the road, and shows what this road is doing for the comfort of its patrons.

This station consists of a main passenger building and agent's dwelling combined, on the south side of the road, and a passenger shelter on the north side, an iron foot bridge connecting both sides, to prevent the necessity of passengers crossing on the tracks. The buildings are constructed of a handsome native gneiss rock, with dark pointing, and Connecticut brown stone dressings. The interior is finished up with hard woods, black walnut and ash, throughout, and presents a very handsome appearance. The main waiting room covers an area of 24 feet by 37 feet, and has an open timbered roof. The building is lighted by gas made on the premises. The engineers and architects were Messrs. Joseph M. Wilson and Henry Pettit.



RAILROAD DEPOT AT BRYN MAWR, PA

THE WEAK POINTS IN IRON CASTINGS.

Iron poured into a mold, on changing from a liquid to a solid state, becomes a mass of crystals. These crystals are more or less irregular, but the form toward which they tend, and which they would assume if circumstances did not prevent, is that of a regular octahedron. This is an eight sided figure, and may be imagined to be formed out of two pyramids having their bases together. In Fig. 1 is a group of crystals from a pig of iron, among which you see one that has, by the aid of favorable circumstances, succeded in gaining the natural form. In a perfect crystal of iron, all the lines joining the opposite angles are of equal lengths and at right angles to each other. These lines are called the axes of the crystal. The crystals assemble or group themselves in certain lines, in the direction in which the least pressure is exerted. When we define the direction of these lines as in the direction of least pressure, we deal with pressure due to the mass itself, and heat leaves a mass of iron according to the same law; and, therefore, the lines of assemblage will be in the direction in which heat leaves the body. This direction is always perpendicular to the cooling surface. We can now state the law upon which we shall base all of our reasoning on this part of our subject. In the case of any casting, upon the metal changing from a liquid to a solid state, the crystals arrange themselves in lines perpendicular to the cooling surfaces; or these lines lie in the same direction in which the heat went out of the iron. If the heat leaves all surfaces of a casting, then each surface will have the lines in which the crystals assemble, and which lie near to it, perpendicular to itself.

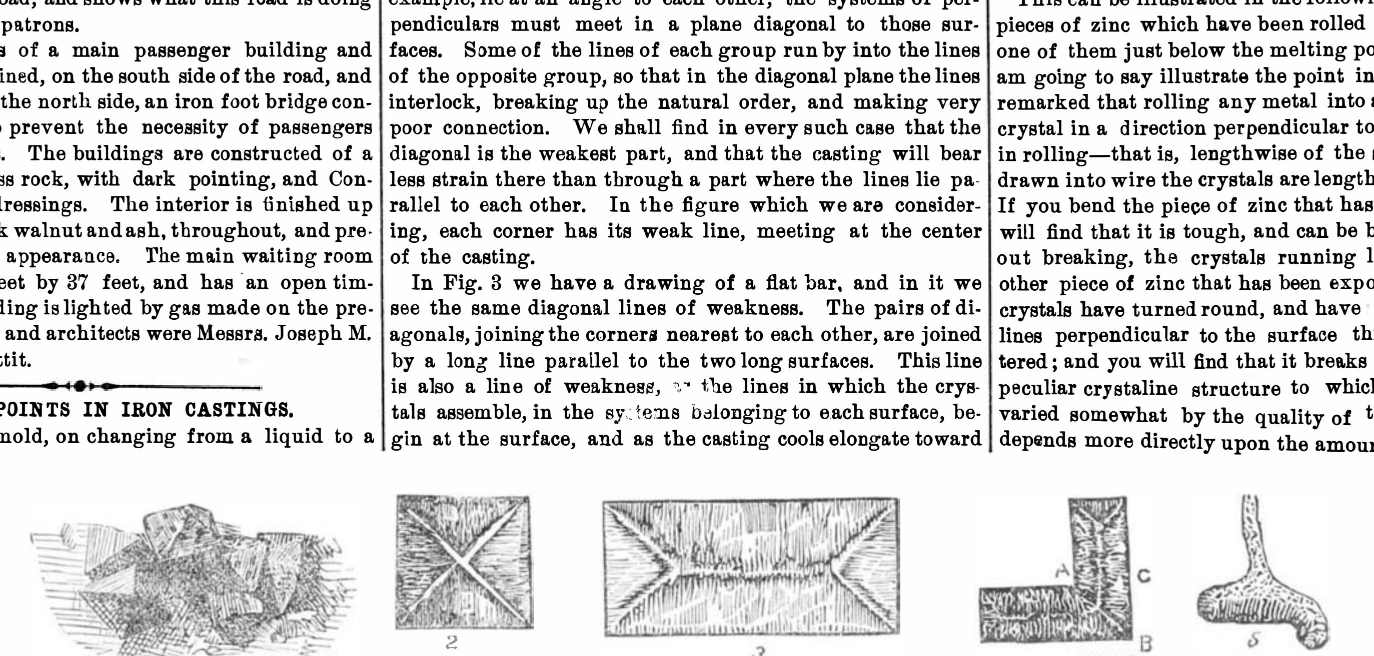
We may then briefly state the law thus: The lines about which the crystals assemble are perpendicular to the surfaces of the casting.

Fig. 2 shows a view of the end of a casting. This shows the assemblage lines, though the individual crystals are too small to be visible. In this figure you see the lines perpendicular to the bounding surfaces; but what I wish to call your attention to especially is the behavior of these lines at the corners of the castings. When two surfaces, as in this example, lie at an angle to each other, the systems of perpendiculars must meet in a plane diagonal to those surfaces. Some of the lines of each group run by into the lines of the opposite group, so that in the diagonal plane the lines interlock, breaking up the natural order, and making very poor connection. We shall find in every such case that the diagonal is the weakest part, and that the casting will bear less strain there than through a part where the lines lie parallel to each other. In the figure which we are considering, each corner has its weak line, meeting at the center of the casting.

In Fig. 3 we have a drawing of a flat bar, and in it we see the same diagonal lines of weakness. The pairs of diagonals, joining the corners nearest to each other, are joined by a long line parallel to the two long surfaces. This line is also a line of weakness, as the lines in which the crystals assemble, in the systems belonging to each surface, begin at the surface, and as the casting cools elongate toward the center. When they meet in the middle they do not form continuous lines through from one surface to the other. Before leaving this class of surfaces, I wish to refer to Fig. 4, also a drawing of a casting. In this way we observe the same phenomena as before, at all of the angles except at the angle, A. Here the metal lying mostly outside of this angle, the lines which we have been considering are perpendicular to the surfaces forming this angle, A, and extend beyond the angle until they interlock, as before, and, together with the diagonal from the corner, B, form a weak line, the entire distance from A to B. Now, though there is much more metal between A and B than between A and C, yet the casting will always break through A B, rather than through A C, the break taking the longer course.

Castings may be made which will not show this peculiar appearance, and may not have it in any marked degree; but if such castings are exposed to heat, the crystals will change position and assemble in lines perpendicular to the surfaces through which the heat entered the casting. The greater the heat the more marked will be this peculiar structure, and the law, as before stated, applies equally in this case, all the crystals finally assembling in lines perpendicular to the bounding surfaces which were heated.

This can be illustrated in the following manner: Take two pieces of zinc which have been rolled into sheets, and heat one of them just below the melting point. To make what I am going to say illustrate the point in question, it must be remarked that rolling any metal into a sheet elongates each crystal in a direction perpendicular to the pressure exerted in rolling—that is, lengthwise of the sheet; and if metal is drawn into wire the crystals are lengthened in the same way. If you bend the piece of zinc that has not been heated, you will find that it is tough, and can be bent many times without breaking, the crystals running lengthwise. Take the other piece of zinc that has been exposed to heat. In it the crystals have turned round, and have formed themselves in lines perpendicular to the surface through which heat entered; and you will find that it breaks when it is bent. The peculiar crystaline structure to which we have referred is varied somewhat by the quality of the metal used, but it depends more directly upon the amount of heat either passing out of or into a casting, or upon the rapidity with which the operation is performed.



We see from the foregoing remarks that the strength of a casting is greatly impaired by the lines of weakness caused by angles, especially re-entrant angles.

Now, let us look for a means of remedy. Referring again to Fig. 2, and then to Fig. 6, or comparing Figs. 3 and 7, we see that by making the angles into curves, the lines in which the crystals form themselves are all nearly parallel to each other, and the absence of abrupt changes of surface also avoids changes in crystalline arrangement, which will materially affect the strength of the casting. Compare Fig. 4 with Fig. 8, and you see that there is the same amount of metal through A B, in Fig. 8, as there is through A C, and yet the strength at the two places is nearly the same. And, of course, their change of form produces a corresponding derangement of crystaline structure, but the defect, which in Fig. 4 was concentrated in the line A B, is in Fig. 8 spread out between the points C and D, so that no single point is much weaker than a similar point beyond C or D.

During the erection of one of the tubes of which the Britannia bridge is composed, a hydraulic press was used, the cylinder of which had a bottom formed as shown in Fig. 9. When pressure was applied the bottom went out, breaking where we would be led to expect it would, through from the inner to the outer angle, as we have shown in Fig. 10, though metal was in excess at that part. A new cylinder was cast, having a semi-spherical bottom, a section of which you see in Fig. 11; and although it was not as thick in the part where the first cylinder broke, yet it sustained a much greater strain without giving way.

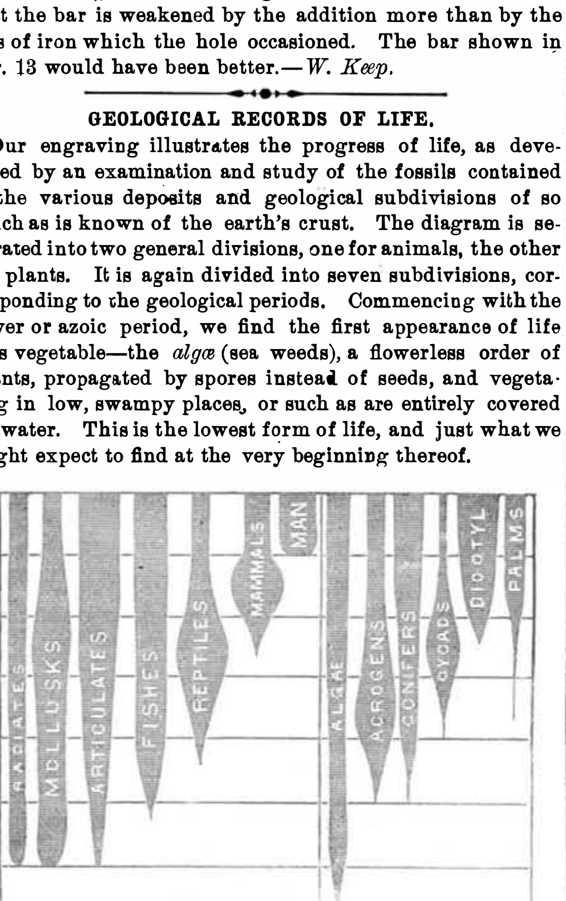
In making patterns for whatever kind of castings, the greatest care should be taken to avoid all angles, of whatever size or shape, for, as has been said already, every change of form brings its corresponding lines of weakness. If curves are necessary, the larger they are the better.

Many of the catastrophes which result from the falling of bridges, or of buildings, might be avoided if this matter had received proper consideration.

For example, it is required to cast a bar with a hole through it. To make up for the iron lost by the hole, the pattern maker adds a square piece to the top of the pattern, as is shown in Fig. 12. When strain is put upon the bar, it breaks through one of the angles at A or B, and it is found that the bar is weakened by the addition more than by the loss of iron which the hole occasioned. The bar shown in Fig. 13 would have been better.—*W. Keep.*

GEOLOGICAL RECORDS OF LIFE.

Our engraving illustrates the progress of life, as developed by an examination and study of the fossils contained in the various deposits and geological subdivisions of so much as is known of the earth's crust. The diagram is separated into two general divisions, one for animals, the other for plants. It is again divided into seven subdivisions, corresponding to the geological periods. Commencing with the lower or azoic period, we find the first appearance of life was vegetable—the *algæ* (sea weeds), a flowerless order of plants, propagated by spores instead of seeds, and vegetating in low, swampy places, or such as are entirely covered by water. This is the lowest form of life, and just what we might expect to find at the very beginning thereof.



GEOLOGICAL RECORDS OF LIFE.

As soon as we leave the azoic period, we come into the lowest order of animal life, which consists of radiates, mollusks, and articulates (crustaceans and worms). Each of these have continued in slightly varying quantities through all geological periods to the present time. The width of the shadings represents their increase or decrease through the several periods.

Fishes next commenced their existence, and have slowly increased in number up to the present time.

Next follow reptiles, and after them mammals, with very important variations in quantities until we reach the age of man, the last and crowning act of creation.

In the vegetable world, as we have already said, we first find the *algæ* or sea weeds—flowerless plants; next come the *acrogens*, a second class of flowerless plants, embracing the coal plants, the wonderful abundance of which, during the carboniferous age, is strikingly manifest from our diagram. The *conifers* also began to appear about this time, and, as will be seen, have steadily increased to the present time. In subsequent succession came the *cycads*, the *dicotyls*, and lastly, the palms—the most magnificent of vegetable creations.

The remains of all these animal and vegetable creations are found as fossils, and always in the order of superposition as here given. They present most interesting and instructive study.

What Constitutes a Mercantile Delivery?

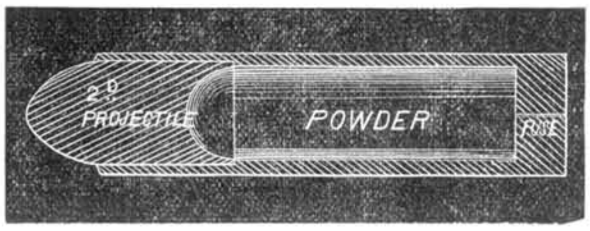
The Superior Court at Boston, Mass., has ruled on the question whether a wagon built to order and remaining in the maker's store room, the buyer having failed to pay for it and refused to allow its sale, was at the buyer's or maker's risk, it having been burned. The court decided that "the article having been specially selected for the defendant, set apart for him and marked with his name, and all with his knowledge, and nothing remaining to be done except that he should pay the agreed price, no further act was needed to vest the title in him, subject to plaintiff's lien for the price, and it remained in the plaintiff's (the maker's) possession at the defendant's (the buyer's) risk at the time of the fire."

Correspondence.

The Sczaroch an American Invention.

To the Editor of the Scientific American:

In your issue of August 1 you describe a recent Russian invention called the sczaroch. I herewith send you a drawing of a projectile which I invented last January, and which I showed to a number of influential men here. I made drawings (which I still possess), and it would be easy to prove the truth of what I say. The enclosed sketch needs no explanation after reading your article of August 1. But I have thought of a use for the projectile, not named in your article.



It cases where it would be of advantage to send a shell a long distance, this could be accomplished by making the outer projectile of rolled iron, so that the second explosion would not burst it. The inner shell would, I think, travel as far as the outer would have done, *plus* the additional distance given by the powder contained in the outer shell. Of course, great accuracy of aim could not be effected.

If I understand the sczaroch, my invention is substantially the same.

Minneapolis, Minn. C. RIDGWAY SNYDER.

V-Threaded Taps.

To the Editor of the Scientific American:

Your surmise that "Max Adeler's" account of his pyrotechnic experiment with Pitman's chickens "emanated from this side of the water" is quite correct. But the *Danbury News* man is guiltless of any part in it. Max is a Philadelphian, and can point a moral with fun, and disclose the ludicrous side of human imperfections. He has had his turn, too, with the plumbers, and tells a story thereof, which, though quite different from that on page 176 of your current volume, is equally moving. This, with much beside to provoke quiet laughter, may be found in his "Out of the Hurly-Burly, or Life in an Odd Corner." From chickens, morals, etc., to taps is a somewhat violent change of base; but it is the very one I must make.

If my experience of nearly thirty years in a machine shop has taught me anything, it is that a tap (I speak only at this time of those having a V thread) should have clearance in all parts of its thread. The curve of any thread between two adjacent grooves should be an involute, not a circle. Simply filing away the tops of the threads is only a little better than nothing. After the thread is finished, grooves cut, and burrs carefully cleaned from the cutting edges, *blue* the tap over a clean fire and let it cool. Now take a good Stubs' taper saw file, lay it nicely between the threads, and file the clearance. The color will show the work of the file, and should be left untouched for a small distance back from the cutting edge, say, in an inch tap, one thirty-second of an inch. A machine tap, never requiring to be turned backward, may be cleared entirely across the section, so that its cut will be like that of a reamer in principle, but with less clearance. A hand tap, which requires to be turned backward, should be filed straight across the section, leaving both the cutting and following ends of each thread up to the original diameter; and the grooves should be shaped something like those in the lower figure on page 187, current volume. This will most effectually prevent any trouble from the cuttings wedging in backing out. A fair mechanic will very readily acquire the knack of filing up taps as above with ease and rapidity. A little experience will also teach him how much clearance is best. Too much causes the tap to work with some irregularity unless very carefully handled, so that it is better to commence with but little. Of course, in establishments where the manufacture of taps is a business, devices can readily be attached to an engine lathe, by which the thread-cutting tool shall receive such movement as will give the clearance as required, without subsequent filing.

Whitworth has made taps in this way for at least twenty five years. A number of establishments in this country are also using similar machinery for tap-cutting with every satisfaction. And a good many smaller concerns are regularly filing all their taps as described above; each, perhaps, with some trifling difference in detail. CALLIPERS.

Philadelphia, Pa.

Grindstone Spindles.

To the Editor of the Scientific American:

For every mechanic who has neither steam nor water power, it is of some importance to have a good method of turning his grindstone by foot power, so that it will not take more than one person to sharpen a tool.

Common grindstone spindles, for this purpose, with a crank at one end, are open to the great objection that the stone will never keep round, because every person is inclined, more or less, to follow the motion of his foot with his hand, which causes the pressure on the stone to be unequal. The harder pressure is always applied to the very same part of the stone, and will soon make it uneven, so that it is impossible to grind a tool true. To avoid this, put in place of the crank a small cog wheel to the spindle, say with twelve cogs; have another short spindle, with a crank and a cog wheel of thirteen cogs, to work into the former. The stone will make about 0·07 of a revolution more than the crank, and the harder pressure of the tool on the stone will change to another place at every turn; and the stone will keep perfectly round if it is a good one. This is a very simple contrivance, but it will be new to many of your readers.

W. KAPP.

Small Printing Press Engine.

To the Editor of the Scientific American:

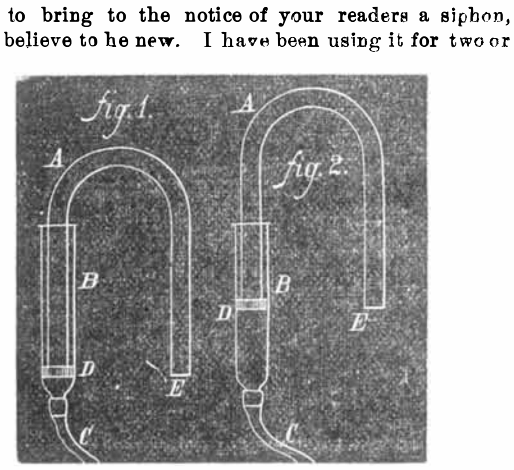
Some weeks since, I noticed an article in the SCIENTIFIC AMERICAN, requesting a statement of the performances of small engines. A few years ago, I built a small engine, which I set up in the *Herald* office in this place. The dimensions of the engine were as follows: cylinder 2 x 4 inches, steam ports $\frac{3}{16}$ x 1 inch, and exhaust $\frac{1}{4}$ x 1 inch. Outside lap of valve was $\frac{1}{16}$ of an inch; no inside lap. Throw of valve was $\frac{1}{2}$ inch. The engine also had a link, the slot of which was 2 inches long. The main rod was 8 inches from center to center. The pin in the crosshead was $\frac{3}{8}$ of an inch in diameter, and the bearing of the main rod on crank was $\frac{3}{4}$ of an inch in diameter. The entire length of the bed plate was 2 inches. The shell of the boiler was $\frac{1}{4}$ of an inch thick, and the heads, $\frac{3}{8}$. The boiler was 3 feet long by 1 foot in diameter, with nine $1\frac{1}{4}$ inch flues. Half of the boiler and the flues made up the heating surface. The grate was 1 foot square. The flame went under the boiler, and returned through the flues to the stack. The pulley on the engine shaft was 6 inches in diameter, over which a belt ran to a 16 inch pulley on a fly wheel of 700 pounds. This wheel was belted to a line of $1\frac{1}{2}$ inch shafting, from which a large Potter newspaper press was run. The pulleys were of equal diameter from the fly wheel to the press. With 75 pounds of steam, the engine, making 300 revolutions per minute, ran the Potter press, printing 1,000 sheets per hour, also a medium sized press printing 1,200 sheets per hour. A small armful of wood and four buckets full of water was sufficient to run off the edition of 1,200 copies in a little over an hour. The water was pumped cold from a tank by a half stroke pump directly into the boiler. The exhaust steam was turned into the stack. Has the performance of this engine been beaten by any similar small engine? The edition was formerly worked off by four men, turning the large wheel by cranks, in four hours. FRANK C. SMITH.

Delaware, O.

A Siphon for Drawing Liquids.

To the Editor of the Scientific American:

I wish to bring to the notice of your readers a siphon, which I believe to be new. I have been using it for two or



three months, and I find it very convenient for drawing acids and solutions. It is composed of the glass tubes, A and B, B being about twice the diameter of A, and drawn down small at one end, to which is attached a rubber tube, C. The tube, A, is packed at D. By immersing E in a liquid, taking the rubber tube, C, between the thumb and forefinger, and drawing it down as far as possible, it will create sufficient vacuum to cause the liquid to pass the bend and flow out, which it will continue to do until the rubber is released. J.W.S.

Magnetic Experiments.

To the Editor of the Scientific American:

On reading the account of the magnetic experiments of Mr. H. P. Henry, on page 100 of your current volume, it occurred to me that an interesting and instructive variation would be to substitute mercury for water. Let the magnet be cemented to the bottom of a glass vessel, to keep it from floating, and then drop iron filings on the surface of the mercury. It seems to me that the laws that govern the movements of the currents would be more correctly exhibited than in the usual experiments on glass and paper, where the friction must necessarily interfere with freedom of movement. The experiment could be still further varied by first sprinkling iron filings on the mercury, and then causing the magnet to approach from above, first with its plane parallel to the surface, then at right angles, etc.

Will you please request Mr. Henry or some one else who has the time and facilities to make the experiments suggested, and publish the results in your paper?

Albany, N. Y. A. F. ONDERDONK.

A RECENT report on the Great Butler Oil District, covering the entire production of the country south and west of Pittsburgh, gives at present 596 producing wells and 81 wells now drilling. There are 1,076 engineers employed. The working capital invested is $1,859,000. The daily production of oil in this district is 15,548 barrels, which indicates a large decrease within the past month.

PRACTICAL MECHANISM.

NUMBER X.

BY JOSHUA ROSE.

FITTING CYLINDERS.

To fit the cylinder cover joint, put marking on the joint face of the cover; put the cover into its place on the cylinder face; then, in order to discover how much the faces are out of true, strike the outside of the cover on one side of its diameter, and then the other, alternately, with the hands; and if the faces at any point are open, they will strike each other with a blow, the sound of which will clearly indicate to what extent they are out of true: if much, the cover may be removed and the high parts rough filed to the extent the judgment may indicate; if, however, when the cover is struck, the faces give no sound of striking, smooth filing will answer. When the faces mark nearly all over, the high spots may be eased with the scraper until the surfaces are sufficiently close that a light coating of marking will mark them all over, when they may be ground together as follows: Place on the cylinder face grain emery and oil, and then put the cover on. Fasten to the cover a lever, and then place sufficient weight upon the cover to leave it capable of being conveniently moved by means of the lever (which should project on both sides of the cover). The cover must not be revolved all in one direction, or the emery will cut grooves in the face, but must be moved back and forth while it is being revolved. When the grinding has proceeded until the cover moves smoothly upon the cylinder face, indicating that the emery has worn down and worked out (as it will do) from between the faces, the cover may be removed; and if the grinding appears equal and of one shade of color all over the faces, the emery may be wiped off them, and the cover replaced and revolved back and forth as before, which will cause the faces to polish each other, removing all traces of the emery, and showing plainly the slightest defect in the surfaces. If, however, the first grinding is not sufficient (as is generally the case), oil and emery must be again supplied, and the grinding continued as in the first instance. The cover of an 18 inch cylinder, even if it is much out, may be made of a steamtight fit by this process in about half an hour.

It is obvious that, in the case of a large cylinder cover, such as are used for marine purposes, the hand will not strike a sufficient blow to indicate how much the faces, before fitting, are out of true, and a block of wood and a hammer must be employed instead.

The next operation is to cut out the cylinder ports to their requisite dimensions.

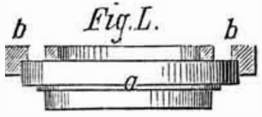
In facing up the valve faces, the surface plate may, in like manner, be struck on its opposite corners, or a pressure may be placed on them by the hands to ascertain if the surface plate will rock, and to what extent. If it rocks at all, a rough file should be employed to file away the high parts of the face; if it does not rock, a smooth file should be employed to take out the tool marks, the filing being continued until a light coat of marking on the surface plate will mark the cylinder face all over, when the scraper may be applied to finish it. The slide valve itself may then be surfaced and scraped to the surface plate, and then placed upon the cylinder face, and the valve and cylinder face scraped together.

The joint of the steam chest may be made by filing the planed surfaces to a straight edge, and placing between the chest, and its seat, on the one hand, and the cover and the chest, on the other hand, a lining of very thin softened sheet copper, which plan is generally adopted on cylinders for locomotives.

In cases where a number of cylinders of similar sizes are made, the whole of the marking off, and much other work, may be saved by the employment of gages, etc.

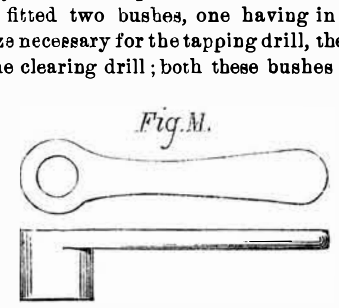
For drilling the cylinder covers and the tapping holes in the cylinder, the following system is probably the most advantageous: The flanges of the cylinder covers are turned all of one diameter, and a ring is made, the inside diameter of which is, say, an inch smaller than the bore of the cylinder; and its outside diameter is, say, an inch larger than the diameter of the cover. On the outside of the ring is a projecting flange which fits on the cover, as in Fig. L, *a* being the cylinder cover, and *b b* a section of the ring, which is provided

Fig. L.



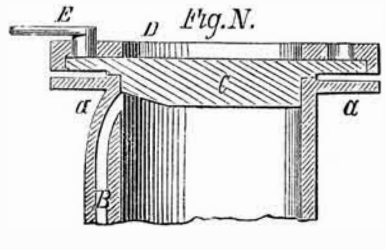
with holes, the positions in the ring of which correspond with the required positions of the holes in the cover and cylinder; the diameter of these holes (in the ring, or template, as it is termed) is at least one quarter inch larger than the clearing holes in the cylinder are required to be. Into the holes of the template are fitted two bushes, one having in its center a hole of the size necessary for the tapping drill, the other a hole the size of the clearing drill; both these bushes are provided

Fig. M.



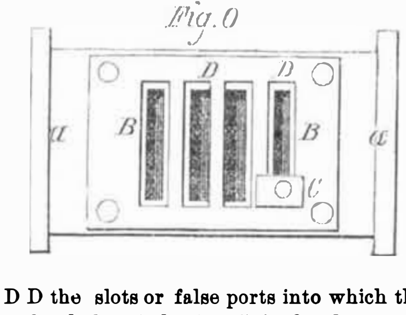
with a handle by which to lift them in and out of the template, as shown in Fig. M, and both are hardened to prevent the drill from cutting them, or the borings of the drill from gradually wearing their holes larger. The operation is to place the cover on the cylinder and the template upon the cover, and to clamp them together, taking care that both cover and template are in their proper positions, the latter having a flat place or deep line across a segment of its circumference, which is placed in line with the part cut away on the inside of the cover to give free ingress to the steam, and the cover being placed in the cylinder, so that the part so cut away will be opposite to the port in the cylinder, by which means the holes in the covers will all stand in the same relative position to any definite part of the cylinder, as, say, to the top or bottom, or to the steam port, which is sometimes of great importance (so as to enable the wrench to be applied to some particular nut, and prevent the latter from coming into contact with a projecting part of the frame or other obstacle): the positions of the cylinder, cover, template, and bush, when placed as described, being such as shown in Fig. N, *a a a* being the cylinder, *b* the steam port,

Fig. N.



c the cylinder cover, D the template, and E the bush placed in position. The bush, E, having a hole in it of the size of the clearance hole, is the one first used, the drill (the clearance size) is passed through the bush, which guides it while it drills through the cover, and the point cuts a countersink in the cylinder face. The clearing holes are drilled all round the cover, and the bush, having the tapping size hole in it, is then brought into requisition, the tapping drill being placed in the drilling machine, and the tapping holes drilled in the cylinder flange, the bush serving as a guide to the drill, as shown in Fig. N, thus causing the holes in the cover and those in the cylinder to be quite true with each other. A similar template and bush is provided for drilling the holes in the steam chest face on the cylinder, and in the steam chest itself. While, however, the cylinder is in position to have the holes for the steam chest studs drilled, the cylinder ports may be cut as follows, which method was introduced in 1867, with marked success, by Mr. John Nichols, who was then manager of the Grant Locomotive Works, at Paterson, N. J.: The holes in the steam chest face of the cylinder being drilled and tapped, a false face or plate is bolted thereon, which plate is provided with false ports or slots, about three eighths of an inch wider and three fourths of an inch longer than the finished width and length of the steam ports in the cylinder (which excess in width and length is to allow for the thickness of the die). Into these false ports or slots is fitted a die, to slide (a good fit) from end to end of the slots. Through this die is a hole the diameter of which is that of the required finished width of the steam ports of the cylinder; the whole appliance, when in position to commence the operation of cutting out the cylinder ports, being as illustrated in Fig. O, *a a* being the cylinder, B B the false plate, C the sliding

Fig. O



die, and D D the slots or false ports into which the die, C, fits. Into the hole of the die, C, is fitted a reamer, with cutting edges on its end face and running about an inch up its sides, terminating in the plain round parallel body of the reamer, whose length is rather more than the depth of the die, C. The operation is to place the reamer in the drilling machine, taking care that it runs true, place the die in one end of the port, as shown in Fig. O, and then wind the reamer down through the die so that it will cut its way through the port of the cylinder at one end; the spindle driving the drill is then wound along. The reamer thus carries the die with it, the slot in the false face acting as a guide to the die.

In the case of the exhaust port, only one side is cut out at a time. It is obvious that, in order to perform the above operation, the drilling machine must either have a sliding head or a sliding table, the sliding head being preferable.

The end of the slot at which the die must be placed when the reamer is wound down through the die and cylinder port, that is to say, the end of the port at which the operation of cutting it must be commenced, depends solely on which side of the port in the cylinder requires most metal to be cut off, since the reamer or cutter, as it may be more properly termed, must cut underneath the heaviest cut, so that the heaviest cut will be forcing the reamer back, as shown in Fig. P, *a* being a sectional view of the cutter, B the hole cast in the cylinder for the port, C the side of the port having the most cut taken off, D the direction in which the cutter, *a*, revolves, and the arrow, E, the direction in which the cutter, *a*, is traveling up to its cut. If the side, F, of the port were the one requiring the most to be cut off, the cutter, *a*, would require to commence at the end, F, and to then travel in the direction of the arrow, G. The reason for the necessity of observing these conditions, as to the depth of cut and direction of cutter travel, is that the pressure of the cut upon the reamer is in a direction to force the reamer forward and into its cut on one side, and backward and away from its cut on the other side the side having the most cut exerting the most pressure. If, therefore, the cutter is fed in such a direction that this pressure is the one tending to force the cutter forward, the cutter will spring forward a trifle, the teeth of the cutter taking, in consequence, a deep cut, and, springing more as the cut deepens, terminate in a pressure which breaks the teeth out of the cutter. If, however, the side exerting the most pressure upon the reamer is always made the one forcing the cutter back, as shown in Fig. P, by reason of the direction in which the cutter is traveled to its cut, the reamer, in springing away from the undue pressure, will also spring away from its cut, and will not, therefore, rip in or break, as in the former case.

In cutting out the exhaust port, only one side, in consequence of its extreme width, may be cut at one operation; hence there are two of the slots, D, Fig., O, provided in the false plate or template for the exhaust port. The cutter, *a*, must, in this case, perform its cut so that the pressure of the cut is in a direction to force the cutter backwards from its cut. The time required to cut out the ports of an ordinary locomotive cylinder, by the above appliance, is thirty minutes, the operation making them as true, parallel, and square as can possibly be desired.

In order to tap the holes in the cylinder heads and steam chest seat on the cylinder true, without requiring the workman to apply the square, a long tap and a guide is employed as shown in Fig. Q, *a* being a section of the cylinder end face, B the guide for the tap, C the tap itself, and D a bolt

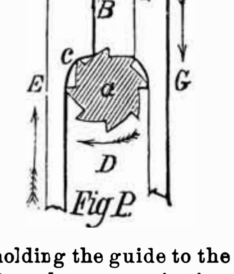
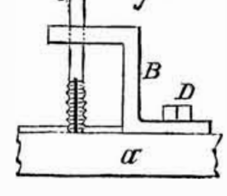


Fig. P

Fig. Q.



for holding the guide to the cylinder face. If the end cylinder faces have a projecting ring on them (so as to leave a small surface to make the joint), the guide may be cut away on its bottom face to fit the projection, so that, if the guide is held against the projection, while the guide is bolted fast, the hole in the guide through which the tap passes will stand true (both ways) of itself, to the hole to be tapped in the cylinder. In the case, however, of there being no projection of the kind mentioned, as, for instance, when tapping the holes in the seat for the steam chest, the guide will require adjusting, sideways, by the eye. The distance, however, of the holes in the guide, being the same from center to center as the distance from center to center of the holes to be tapped, insures, without any setting, that the holes tapped are true with each other one way.

The saving of time and labor effected by means of the employment of this system and its appliances is much greater than might be supposed at first sight; it may, however, be appreciated when it is stated that, under it, three pairs of locomotive cylinders have been fitted up in seven and a half days, the work done to each pair being the holes, amounting to 200, drilled, and those for the cylinder covers, cylinder cocks, steam chests, steam pipes, and exhaust pipes, tapped; the steam and exhaust ports cut out, and the faces and those of the slide valves scraped up, the cylinder end and cover faces filed, scraped, and ground up steamtight, the steam chest seat faces filed up true to a straight edge, the seat for the steam and exhaust ports faced out with the cutter, all necessary bolts and studs put in, the cylinders bolted together, their bores being set true with each other, and the whole turned out so that the cylinders were complete and ready to bolt to the engine frames.

Rapid Transit in New York.

The American Society of Civil Engineers has appointed a committee, consisting of O. Chanute, M. N. Forney, Isaac C. Buckhout, Charles K. Graham, and Francis Collingwood, to investigate the necessary conditions of success, and to recommend plans as to the best means of rapid transit for passengers, and the best and cheapest methods of delivering, storing, and distributing goods and freight in and about the city of New York. Investigations of this kind by the committees of the Legislature, of the Common Council, and of private citizens have been annually made, in New York, during the past twenty years. There are any quantity of plans. The only thing lacking is the money to build with. If the present committee can solve that problem, they will render valuable service, and do something that the wealthiest capitalists of the city have not yet been able to accomplish.

Death of Judge Benjamin R. Curtis.

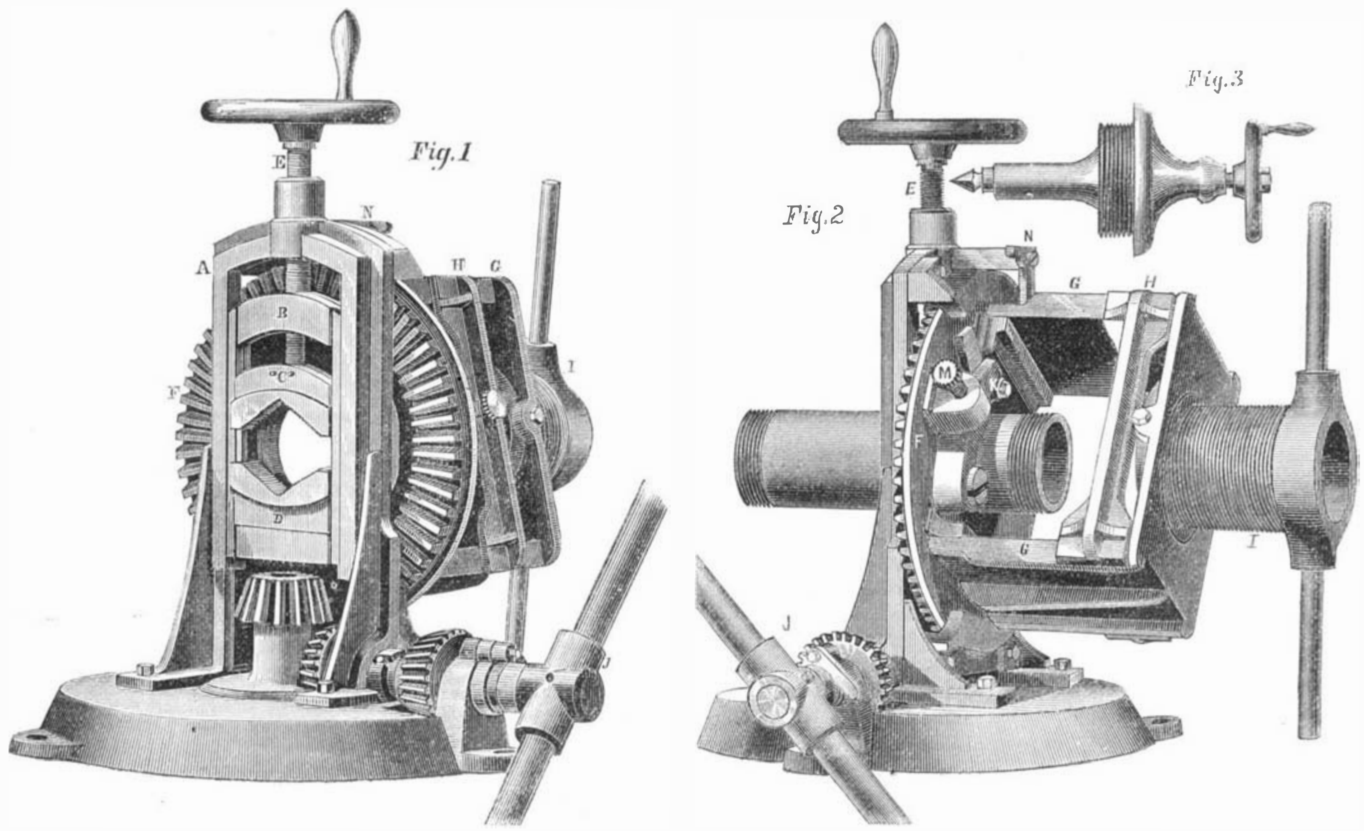
We regret to announce the death of this eminent jurist, which took place on September 16. Born in Watertown, N. Y., on November 4, 1809, he graduated at Harvard in 1829; and three years afterwards he commenced legal practice. From this date his career was one continued success, gaining him fame as a lawyer, an orator, and a logician. In 1851, he was appointed Judge of the Supreme Court of the United States, and here he delivered his celebrated decision in the Dred Scott case. He resigned his seat in 1857, and resumed his practice. He defended President Johnson before the Court of Impeachment.

Judge Curtis' learning and high personal character gave great value to his writings and his judicial decisions. His return to the bench was looked for when his death occurred.

IMPROVED PIPE AND BOLT THREADER, CUTTER, AND NUT TAPPING MACHINE.

The accompanying engravings illustrate an improved machine, intended to perform the work enumerated in the title of this article, the nature and advantages of which are specified in the following description:

A is the frame which supports the entire machine. In this frame slides a vise holder, B. The shape of the vise holder is a parallelogram, except at the top, which is slightly arched. It slides in ways formed on the inside of the vertical part of the frame. On the inside of the vertical part of the vise holder, B, are formed ways which guide the movement of the upper half of the vise, C. The lower half of the vise, D, is fastened in the lower part of the vise holder, B. In the arched top of the vise holder is formed a threaded hole for the upper part of the differential screw, E. A thread is also formed in the upper part of the frame, A. The end of the differential screw plays freely in a step socket in the upper part of the vise, C. The pitch of the screw in the upper part of the frame is twelve to the inch, and in the upper part of the vise holder, B, it has a double thread, six to the inch. The turning of the screw, therefore, causes the lower part of the vise holder, B, to rise, while the upper part of the vise, C, descends, or *vice versâ*. The purpose of this movement is not only to gripe the pipe or bar to be threaded or cut off with great firmness, but also to make the apparatus self-centering. To the front side of the wheel, F, is attached the casting, G, which forms ways upon which the die carriage, H, travels. By this means the dies are carried forward constantly parallel to themselves and the work, thus obviating friction from any deviation from the parallel motion, and preventing stripping of the thread—a difficulty heretofore encountered in many pipe cutting machines. The die carriage is forced forward at the commencement of the operation by means of the left hand lever screw, I, the purpose of which is to make the dies engage the work at the beginning. As soon as the thread is started, the carriage, H, traverses of itself, at a rate corresponding to the pitch of the screw cut, in the same way as a chaser follows the thread in cutting a screw in a hand lathe. The carriage, H, the casting, G, and the wheel, F, are all caused to rotate by means of bevel gearing actuated by means of the balanced lever handle, J, which is shown broken away in the engraving, to avoid unnecessary space. K, Fig. 2, represents the cutting device, by which pipes or bars are cut off. This consists of a pivoted tool holder, which is fed by the ratchet headed screw, M, which turns in the threaded hole formed in a lug.



PIPE AND BOLT THREADER, CUTTER, ETC.

Motion is imparted to the screw, M, by coming in contact with the pawl, N, at every revolution of the wheel, except when the pawl is turned up out of the way in cutting threads. In this way, an automatic intermittent feed is obtained, which is considered of great advantage, as, in machines with automatic continuous feed, the contact of the tool with a high spot in the iron often results in splitting the pipe, owing to the increasing depth of cut consequent upon the nature of the feed and upon the suddenly increased depth of the cut caused by the lump. The reason for this is that, with the continuous automatic feed, the tool is constantly entering deeper and deeper into the material, while with the intermittent automatic feed it can be so set as to cut only to such a depth as ensures safety to the tool and to the material itself, according to the nature of the work to be performed. In the performance of most kinds of work, a deeper cut can be taken, and the cutting can be performed faster than with machines having automatic continuous feed. By sliding the handle, J, in or out, so that a pin on the shaft engages with the inner or outer pinion of machine, the speed of machine is increased or lessened as desired.

Fig. 2 represents the machine in the operation of cutting off a piece of pipe. The machine can also be used for tapping nuts, the tap being held in the vise and the nut in the carriage, H, or *vice versâ*.

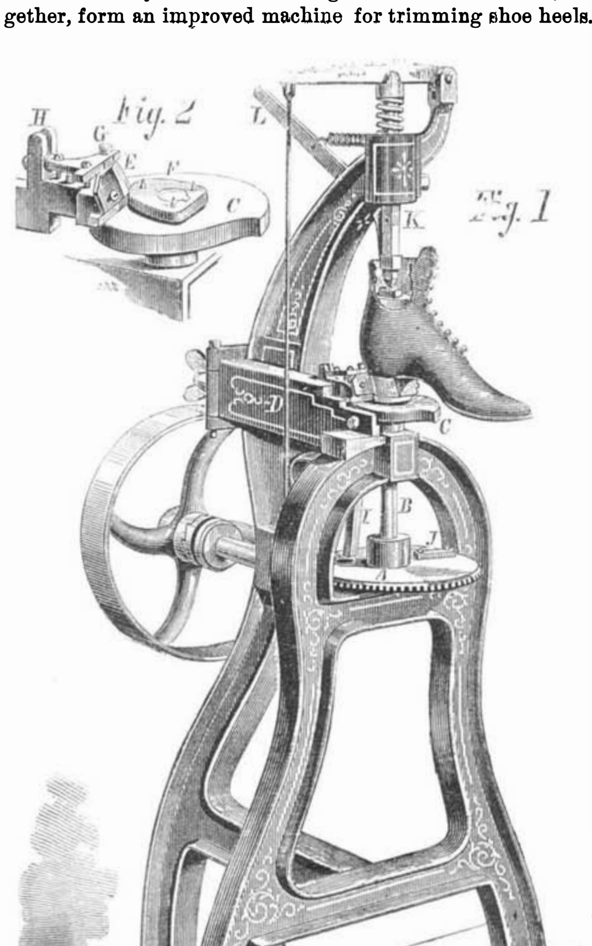
Fig. 3 shows a centering device, which is put in place of the screw, I, for centering bars after they have been cut off, and to prepare them for turning in the lathe. Either square or round iron may be thus cut off and centered, the screw, I, being removed, and the centering device in Fig. 3 being substituted.

It will be seen that the capacity of this machine is unusual. It cuts and threads pipes and bolts, taps nuts, and cuts off and centers bars to fit them for the lathe. It is extremely compact, weighing only one hundred and eighty pounds, and can be run either by hand or power. A power attachment is supplied with a backward and forward fast and slow motion, so that the machine can be driven by power by merely throwing the belt over the main shaft, without putting up a counter shaft. The machine is therefore portable, and its convenience is greatly enhanced. It can be used in any part of the shop where it is most convenient. All the parts are interchangeable, and may be replaced when damaged by any accident.

Patents for this machine have recently been obtained. Further particulars may be obtained by addressing Mr. C. T. Litchfield, General Manager of the Empire Manufacturing Company, 18 William street, New York city.

JONES' HEEL TRIMMING MACHINE.

In the invention represented in our illustration are combined a variety of novel and ingenious devices which, together, form an improved machine for trimming shoe heels.



The motive power may be steam, in connection with a pulley, or hand labor, employed through a crank. Upon a horizontal shaft is a bevel gear wheel, A, which rotates the vertical shaft, B. At the upper end of the latter is a double cam plate, C, the edge of which is suitably shaped to allow the arm which carries the knife to move onward at the proper time. The arm works in the casing, D, and its outer end is pivoted to a plate attached to the rear part of the frame. Upon its inner side is formed a socket to receive the knife bar, into which is adjusted a screw rod (operated by a thumb nut, shown at the rear) which limits the movement of the knife, and also serves as a guide for a coiled spring, by which the latter is held out to its work.

In Fig. 2 the cam plate and cutting mechanism are represented on a larger scale. E is the knife, in front of the right hand lower corner of which projects a finger, which rests against the guide, F. The latter is secured detachably to the shaft, B, above the cam plate, as shown. It is of the exact form of the required heel, and must be changed for differing sizes of the same. On the upper side of the knife bar, at G, is a gage, which presses against the counter, and, projecting a little in front of the edge of the knife, keeps the same evenly around the seat of the heel. It may be raised or lowered to suit various hights of heels, and may be moved nearer to or further from the work by means of the screw operating in the slotted projection, H. There is also a washer under the guide, F, which varies the same so that the knife may rest against it for a distance of an eighth of an inch or more, as desired.

To the forward end of the knife arm is attached a hook rod, which enters a groove under the cam plate. This portion of the device is necessarily hidden by other parts in the engraving. The object, however, is to cause the knife to move forward quickly to cut the elongated sides of the heel, and slowly while cutting the short curve of the rear portion of the same. At I is shown the lower extremity of a drop or clutch, which is hinged to the frame at or near its middle, so that its upper end enters a socket on the under side of the knife arm. At a certain point of the revolution of the gear wheel, A, a stud, J, thereon comes in contact with the drop and carries the same partially around, thereby relieving the strain on the hook pin when it enters the short curve of the slot of the cam plate, at the same time serving as a brake.

The rear leg of the frame projects upward and curves forward, so that its upper extremity is directly over the vertical shaft, B. Through this upper end passes a shaft, K, which connects with a spring lever above. The latter is operated by the treadle shown, and the device serves to hold the shoe down upon the guide. Near the lower end of the shaft, K, is a joint worked by the lever, L, the object of which is to trip the shoe, when it becomes necessary to give one part of the heel more bevel than another. The knife, besides, has a spring upon its inner side which will allow of its conforming to all ordinary styles of heels without requiring the employment of the tripping lever.

The mode of adjusting the shoe to be operated upon is already shown in Fig. 1. The pulley is operated over about 2½ revolutions to trim the shoe, and the speed required is some fifty revolutions per minute.

Patented through the Scientific American Patent Agency, July 1, 1873. For further particulars relative to sale of rights, etc., address the inventor, Mr. E. U. Jones, Woodhaven, Queen's county, N. Y.

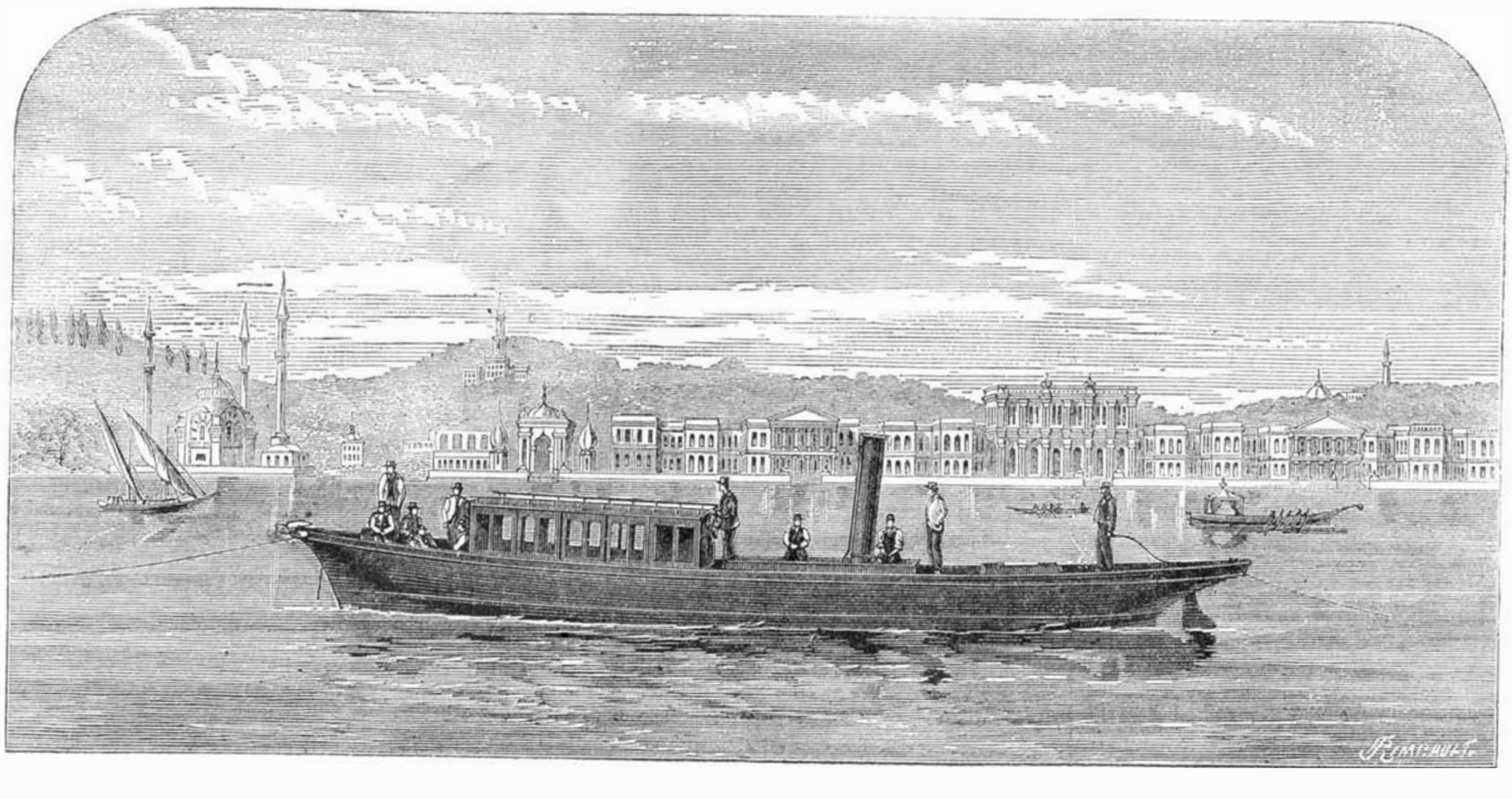
A sample machine may be seen at the office of Messrs, William Butterfield & Co., 6 Murray street, New York city or at the Bay State Shoe Works, King's County Penitentiary, L. I.

REMARKABLE FALL OF A RESERVOIR.—A reservoir to supply Conshohocken, Pa., was built last fall at a cost of $72,000, and is an excellent piece of workmanship. Its supply was pumped from the Schuylkill river, and throughout the past year the town of Conshohocken has been plentifully supplied with water, to the gratification of the citizens. Recently the reservoir was discovered to be empty, and the keeper, in making his morning inspection, discovered that a portion of the embankment had dropped straight downward for 25 feet, and resolved itself into an enormous hole, the sides of which are precipitous rock.

THE VICISSITUDES OF MINING.—It is bad enough for miners to be deluged with cold water; but to be drenched with the hot article is rather trying. This is what recently happened to the Gould & Curry people in California. A large body of hot water was struck in the 1,465 foot level of the Consolidated Virginia mine. From this level a drift extends into the Gould & Curry, with a downward slope, and the water runs into the latter mine. The Gould & Curry pump is a foot in diameter, and it requires its utmost capacity to control the water.

NEW YACHT FOR THE KHEDIVE OF EGYPT.

Mr. John Fowler, C. E., recently instructed Mr. J. S. White, of Cowes, England, to build a yacht for the personal service of the Khedive of Egypt. The instructions were to provide a launch which should be a good sea boat, stiff in the water, and of a mean speed of at least 10 miles per hour on a continuous run at sea. These conditions have been admirably fulfilled in the launch under notice. Her sea-going qualities were thoroughly tested during her run from Cowes to London in the face of a strong easterly gale, and her speed in fair weather was easily maintained at one mile per hour above the contract rate for any desired length of time.



STEAM YACHT FOR THE KHEDIVE OF EGYPT.

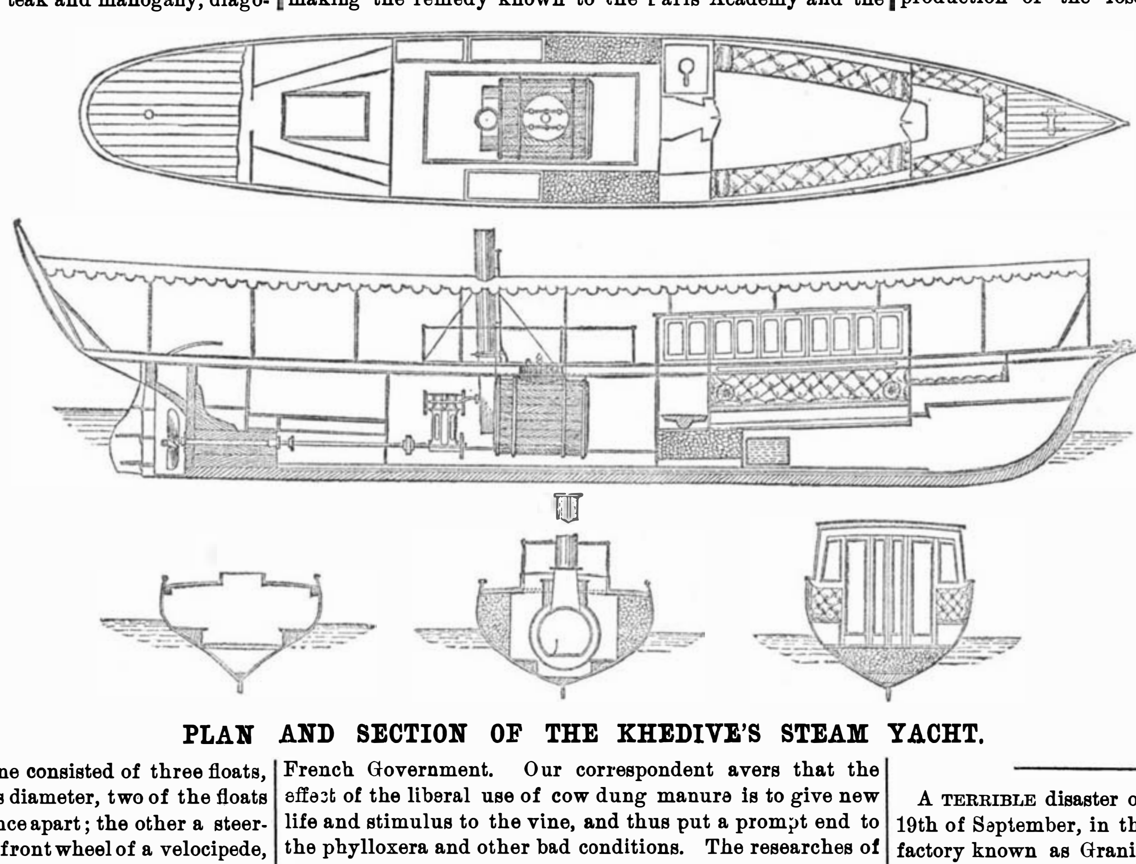
The following are a few of the leading dimensions:

Length, 50 feet; breadth, 10 feet; draft forward, 2 feet 10 inches; draft aft, 3 feet 6 inches; displacement, 11 tuns; screw (four bladed), diameter, 3 feet 6 inches, pitch, 3 feet 3 inches to 4 feet 6 inches; cylinders, diameter, 7¾ inches, stroke, 6 inches; grate surface, 5·5 square feet; heating, 215 square feet.

At the speed of 11·03 miles (9·58 knots) per hour, the number of revolutions was 268, and the boiler pressure 76 lbs. per square inch. With a mean effective pressure in the cylinders equal to 75 per cent of that in the boiler, the power developed would be 43·4 indicated horse power, an exceedingly good result for so small a boat.

The launch is built entirely of teak and mahogany, diagonally, coppered and copper fastened, and the interior fittings are most luxuriously carried out in white satin and gold. Even the awning is profusely ornamented with gold braid; indeed, the instructions generally were to make the boat in every detail as perfect as possible, and that no legitimate expense need be spared to attain that end.

The engines were constructed for Mr. White by Messrs. G. E. Belliss & Co., of Birmingham, and they behaved admirably during the stormy run from Cowes to London, when their failure but for a quarter of an hour would, at times, have inevitably entailed the total destruction of Mr. White's very perfect launch and of the lives of those navigating her.—*Engineering.*



PLAN AND SECTION OF THE KHEDIVE'S STEAM YACHT.

A Tripod Boat.

A novel boat velocipede was lately tried on the Allegheny river at Pittsburgh. The machine consisted of three floats, each three feet long by 15 inches diameter, two of the floats placed side by side, a short distance apart; the other a steering float placed in front, like the front wheel of a velocipede, and made movable. A seat on slender rods rising from the two central floats supported the operator. Between the two floats were a pair of 8 inch paddle wheels worked by cranks from the driver's seat, where the front steering float was also operated. This novel machine, when set in motion, carried its inventor safely across the river at the speed of a slow walk. The paddles are evidently too small. A contrivance of similar character was suggested some time ago, we believe by W. J. Allen, of Grand Rapids, Mich.

AT the last advices, Coggia's comet was brilliantly visible in Australia.

The Phylloxera.

We recently published the terms of the reward of $60,000, offered by the French Government, for a remedy for this extraordinary vine pest. At a recent *séance* of the Paris Academy, no fewer than eleven communications were received relating to the destruction of the phylloxera. A letter from a vineyard proprietor proposed sowing tobacco seed among the vines: he had found this an effectual remedy, in the case of artichokes, for destroying an aphis which attacked the roots. Hemp and *datura stramonium* were proposed as preferable to tobacco, on account of fiscal restrictions on the latter. One suggestion was to destroy the insect by electrical discharges. A committee of the Linnæan Society of Bordeaux have pronounced, as the result of their researches, that the phylloxera is not the cause of the disease, but an effect of an organic malady attributable to five causes, which they specify (exhaustion of soil, inclement seasons, bad choice of stocks, and bad treatment, etc.). They state that while phylloxera is an effect, it may aid in deteriorating the vine.

A correspondent of the SCIENTIFIC AMERICAN declares that the liberal use of cow dung manure is a sure cure for the phylloxera on vines. He wants the editors to bring it to the attention of the French authorities, and offers to give them one half of the reward, namely, $30,000, when the whole sum is paid over. We accordingly take pleasure in making the remedy known to the Paris Academy and the French Government. Our correspondent avers that the effect of the liberal use of cow dung manure is to give new life and stimulus to the vine, and thus put a prompt end to the phylloxera and other bad conditions. The researches of the Linnæan Society of Bordeaux appear to confirm the theory of the SCIENTIFIC AMERICAN'S correspondent; and should the remedy proposed be adopted in France as effective, we request the French authorities to remit the amount of the reward to this office, without any formalities.

LUMINOUS APPARITIONS OR FALSE LIGHTS.—These are not due, as was long supposed, to the products of animal or vegetable decomposition, but are caused by insects which possess organs that become luminous at the time of their sexual congress. It is now well known that the phosphorescence of the sea is due to the presence of immense numbers of microscopic animals.—*Journal of the Chemical Society.*

Phosphorescence of Putrified Animal Matters.

Phosphorus exists in animal flesh in the state of alkaline or earthy phosphates, and also as one of the elements in protagon. The phosphorescence and alliaceous odor, sometimes observed during the putrefaction of flesh, are due to the formation and subsequent decomposition of sulphur phosphide. This substance, formed from the sulphur of the fibrin and the phosphorus of the protagon, is spontaneously inflammable in presence of oxygen, producing hydrogen sulphide and phosphorus or phosphoric acid.

Muscular flesh, to which $\frac{1}{1000}$ part of its weight of calcium phosphate was added, and which was kept at the ordinary temperature, had a very fetid odor by the third day, while a sample not treated with calcium phosphate did not become putrid until the sixth day. As all ordinary waters contain calcium and magnesium salts, it is desirable that they should not be used in the cleansing of ulcers, etc., for, by the combination of these salts with the alkaline phosphates of the flesh, active agents of decomposition are produced.—*J. Lefort.*

Otto of Roses.

The *Moniteur Industriel Belge,* in an interesting article on this costly perfume, says that the manufacture is largely carried on in the valley of Kesanlik, Roumelia, the annual production of the rose farms of which amount to 4,400 pounds of the otto per year. As it requires about 130,000 roses, weighing some 57 pounds, to make an ounce of the oil, some idea of the extent of the plantations may be formed from the above given total.

The flowers are gathered in the middle of May, and the harvest continues for three weeks. The blossoms collected each day are at once worked, in order that none of the odor may be lost. The process consists in distilling them in water and then causing the water alone to undergo distillation, when the oil is skimmed from the surface. The labor is principally done by women and children, at wages of about ten cents per day.

The otto is always adulterated, before transmission to market, with one third or one fifth its quantity of geranium oil.

A TERRIBLE disaster occurred in Fall River, Mass., on the 19th of September, in the burning of a cotton cloth manufactory known as Granite Mill No. 1. The building was a large granite structure, some 368 feet in length, and five and a half stories in hight, containing the usual spinning and other machinery. About 350 operatives were employed, a large proportion of whom consisted of girls and children. Twenty were killed and thirty wounded. The mill was badly provided in respect to fire-extinguishing apparatus and means of escape.

A CORRESPONDENT, Mr. L. P. Alden, of Quincy Mich. states that the striped potato bug was for many years common in Southern Illinois, and that its vesicatory powers were well known.

["OLD AND NEW."]

DENTISTRY IN THE UNITED STATES.

NUMBER 4.

INSTRUMENTS USED BY DENTISTS.

These are classed by the profession into extracting, plugging, excavating, and scaling instruments. It is impossible to give an accurate statement of the number of different forms used of all these; but the dental catalogues of the present day will show over ninety different patterns of forceps alone—an instrument used only for extracting teeth. There are, besides, five different forms of turnkeys, and eighteen different forms of screws, punches, and elevators. All these hundred and thirteen instruments are used solely for extracting teeth and stumps, or roots, of teeth. As a fully furnished mouth contains thirty-two teeth, arithmetic will show that there are just $3\frac{17}{32}$ kinds of these instruments to each tooth. This proportion, however, becomes quite in significant when compared to the number of plugging instruments. Of these, according to the catalogues and to my own knowledge, there are over four hundred varieties in respect to size and to shape of point, all used to consolidate the material with which the cavities in the teeth are filled. The patterns of excavators, burrs, and drills, used to clean out these cavities before filling, will number over three hundred and twenty-five; and one hundred and eighty different patterns and sizes are used of chisels, gouges, and scalers, used to remove tartar from the surface of the teeth, or for cut ting down the walls of cavities before using the excavators. This grand total of one thousand one hundred and eighteen differently shaped instruments sums up the class of standard patterns regularly sold by the dealer to the operator. As though this were not variety enough, it is made still greater by putting all these instruments, except the forceps, in handles of different kinds and sizes. The finer ones are of pearl, agate, and cameo; the second class of ivory, ebony, buffalo horn, walrus tooth, and bleached bones; and the cheapest, of steel file-cut, steel octagon, taper steel, and plain steel finish. This makes twelve styles of handles. Of each there are several sizes; those most commonly used being quarter inch, half inch, five eighths, and seven eighths. These forty-eight different sizes and styles, of course, make the total number, in a complete assortment of plugging instruments, fifty-three thousand, six hundred and sixty four, which the dealer must keep on hand, at only one of each. As, however, he must have in stock several gross of some of them, that total gives a very inadequate idea of the capital invested in the stock of a first class dealer.

To give the names of these different instruments would require, at least, twenty octavo pages closely printed. The specification would begin somewhat thus:

First, extracting instruments, divided into forceps, turn keys, and stump instruments. The forceps are subdivided into lower central, lower lateral, lower canine, right lower bicuspid, left lower bicuspid, right lower molar, left lower molar, right lower wisdom, left lower wisdom; then the same over again, substituting upper for lower; also various shapes of alveolar forceps, splitting forceps, screw forceps, cow horn forceps (named from a peculiarity in their shape), bayonet forceps, separating forceps, fragment forceps, wedge-cutting forceps, and so on. (N. B —These are the names of a part only.) The turnkeys have each a particular name, and so have the stump instruments. The pluggers are subdivided into hand, mallet, and automatic pluggers, and each of these heads is subdivided. The burnishers, by the way, are always classified with the pluggers. As the names indicate, the hand pluggers are used to condense the filling by manual pressure; the mallet pluggers, by striking them with a small mallet, some dentists using a leaden one, because its blow is "soft," while the majority prefer lignum vitæ. The automatic plugger has a hollow handle and a spring inside with a small catch: the head has a solid piece set in; and, when the point is pressed against the filling, the shaft re cedes into the handle a fraction of an inch, pressing against the spring, which, slipping off the catch, allows the handle head to come suddenly down upon the butt of the shaft, which thus receives a blow like that given by the mallet. Other automatic instruments have an arrangement inside for striking with a drop weight, somewhat as in a pile driver. The names of the excavating instruments are too numerous to give; there are hoes, hatchets, spades, rights, lefts, etc., hooks, wedges, and spears. The burrs are cone, cocked hat, flat head, bevel edge, round, spoon bill, etc. The drills are square, twisted, bevel point, Scranton, etc. In like manner, the scalers and chisels have their separate descriptive names. Then there are a number of miscellaneous instruments, which could not be classified under any of the above heads: nerve and abscess instruments; gold, silver, rubber, and glass syringes; saliva pumps; napkin, check, and tongue holders; lip protectors, and a variety of others, all used solely in repairing the natural teeth.

The manufactures of dental materials, knowing what instruments are most generally used, have contrived various neat patterns of cases for holding them, and will furnish a case with the most useful operating instruments, complete, at prices varying from seventy-five dollars to twelve hundred and fifty dollars. More expensive ones can be had if required. The dentists of the Eastern division of the States prefer using what are termed the loose instruments, for they believe more in fact than fancy; and they find it economical, if the point of an instrument break, to be able to fit another at once into the same handle. An Eastern dentist will probably be satisfied with an operating kit costing fifty dollars—this means of instruments, only for repairing the natural teeth—while the dentist of the Western division will not be contented unless he has a two hundred and fifty dollar case of instruments to start with. This he keeps to show to his patients, the majority of whom will judge of his professional ability by the amount and quality of his outfit. He is shrewd enough, however, both to use this as a plaster to draw custom, and to use "loose instruments" to operate with. More sad is the case of the beginner in the Southern division. He must not only have his fine outfit for show, but must use it to cover up some of the blunders of his inexperience. The quality and style of an operator's instruments are no criterion of his ability; for I have known dentists, who, with a chamois skin roll-up case, with seven pairs of forceps, one turnkey, four stump instruments, and a gum lancet, were ready to extract any tooth that was ready to be extracted, and to do it neatly, quickly, and successfully. During the civil war, the United States Government furnished its military surgeons with this kind of outfit; and no complaint was made about it, although cause enough might have been found. There was not a sufficient variety of tools; and, as they were made of that inferior steel called German steel, they had to be heavy or clumsy in order to bear the strain put on them. Nor would the price paid by the government allow of their being polished as highly as is required both for the looks and for the preservation of instruments.

Over two hundred dozen of these cases were made by one manufacturer in New York city; and those which were rejected by the inspectors were purchased by private practitioners at fair prices, which shows what materials some dentists will use. The richest outfits of dental instruments, as a general rule, are sold for foreign service. I call to mind two dental cases, one costing $1,800, the other $1,500. The former was made expressly for an employee of the Chilian Government. He was not engaged in a dental capacity, but as an engineer, having, with several others, to make a map of that country. Notwithstanding the high position he held, he could not forego the pleasure he derived from his original profession of dentistry, which he had practised in the Eastern states before going South. The case ordered and accepted by him has never been excelled; the extracting instruments being all octagon-shaped and plated, the others having, some agate handles, others pearl set with garnets and rubies, all with coin gold ferrules. The case was rosewood with silver corners, and plate inlaid. It was on exhibition at the manufacturers', in New York, several days before shipment, and was seen by hundreds. The other was for a young man who borrowed enough to pay for a handsome outfit, and went to Havana, Cuba, where it assisted him not only in paying for itself, but in accumulating a fortune. The most parsimonious outfit ever purchased, in proportion to the wealth of the purchaser, so far as I know, was bought for two hundred and fifty dollars by the far famed Don Esteban de Santa Cruz de Oviedo, of diamond wedding notoriety. He owned an extensive plantation in Cuba, and preferred operating on the teeth of his slaves himself, to giving it out to any of the many itinerant practitioners who perambulate that country. There are at present only three large firms who manufacture dental instruments exclusively; though there are many small shops in which instruments of all kinds are made on a small scale. One of these large firms made and sold during one year twenty-five thousand pairs of forceps (one instrument is called a pair); that is, about eighty a day for each working day in the year. This was something more than the usual quantity. But sixty a day is considered a medium business in that establishment; and this number, with the additional labor necessary to turn out enough of the smaller instruments to make up assortments, gave employment to sixty workmen.

In the manufacture of dental instruments, each workman must thoroughly understand his part; for the slightest blunder, from the "forger" to the "burnisher," will cause an instrument to be rejected from the first class. Any one not conversant with the practice of dentistry might suppose that a dentist once supplied is always supplied; but not so. He is continually breaking the points of the smaller instruments, cracking the joints of larger ones, having them altered into new patterns, getting new styles, and discarding the old; and is thus daily purchasing and changing. Many dentists who commence with two hundred dollars' worth of instruments keep on purchasing to the extent of three hundred dollars during their first year, and even at that they find they have not all they require, and repeat the same the following year. There is expended every year for dental instruments in the United States not less than half a million of dollars. The Eastern division invests about $160,000 of this; the Western, about $140,000; and the Southern about $200,000.

Usual Causes of Fires.

Churches and lecture rooms of all descriptions.—Hot air, hot water and steam pipes, and furnaces and stoves. Sticking candles against coffins in vaults. Christmas and other deco rations around or too near gas fittings, fires, or lights. Sparks falling upon birds' nests in spires and belfries.

Curriers and workers in leather.—Lime slaked by rain. Sparks from foul flues and furnaces passing through opening and projecting eaves of drying rooms. Friction of machinery in bark mills. Timber, coals, shavings of wood, and leather too near flues. Drying stoves and furnaces. Spontaneous ignition. Smoking in bark and other rooms.

Drapers, tailors, makers up and vendors of male and female attire.—Working late, being tired and falling asleep, or be coming careless too near fires and lights. Unprotected and swinging gas brackets. Crinolines coming in contact with fire in open fireplaces. Light, pendent goods being blown, by the opening and shutting of doors or by concussions or drafts, into unprotected lights. Goods hung on lines increase the risk in various ways, such as conveying the flame from one end of a room to the other, and, when the line breaks down, making three separate fires, one at each end and one in the middle at the same time, thus originating three distinct fires for each line. Cuttings left carelessly about. Using lights while intoxicated, especially by tailors' work-people. Ironing stoves, hot plates, smoothing irons, etc., too near and sometimes on timber and goods. Smoking tobacco, and matches for lighting it.

Engineering works, and workers in metal of all descriptions. —Sparks from striking hot metal. Hot metal castings, etc., left too near timber. Heat from furnaces, forges, and smiths' hearths and flues. Friction of machinery. Japanners' stoves overheated or defective. Accidents with melted or hot metal. Explosions of blast furnaces. Spontaneous ignition of oily waste, molders, lamp, and other blacks; sawdust or sweepings and oil; spontaneous heating of iron turnings, etc., when mixed with water and oil.

Farming stock, stables, hay, grain, or flour stores of all descriptions —Stacking hay while green. Sparks from passing locomotives, etc. Sparks from steam thrashing machines. Sticking candles against walls and timber in barns and stables. Vagrants smoking in stables. Vagrants being refused alms. Fire arms used near farming stock, such as haystacks, etc.

Makers of gunpowder, fireworks, lucifer matches, and explosive compounds.—Overheating of drying stoves, and explosive mixtures. Dropping lucifers. Unprotected lights. Smoking. Leaving phosphorus uncovered with water. Friction and percussion from nails in boots. Sparks passing through broken windows. The sun's rays being concentrated through bull's eyes, knots, etc., in glass. Defective casks containing gunpowder or other explosive materials. Spontaneous ignition of red fire and such like compositions. Carelessness in the supervision of young children employed. Shavings and chips too near fires and lights.

Gas works —Hot coke near timber, etc. Seeking for an escape with unprotected lights. Timber too near furnaces, retorts, etc. Lime slaked by rain. Defective fittings and appliances. Spontaneous ignition of coals.

Hat manufactures.—Boiling shellac. Hot irons left on timber and other inflammable things. Defective drying and other stoves. Smoking tobacco.

New Lecture Experiments.

Oxydizing Power of Charcoal.—Freshly prepared leucaniline dissolves in alcohol, and forms a perfectly colorless liquid, which may be kept for a long time without change. If this solution is boiled for a few moments with a small quantity of animal charcoal, it becomes of a deep carmine red, due to the action of the oxygen condensed in the pores of the charcoal.

Oxidation, shown by Change of Color in Compounds on Contact with Air.—If a tolerably concentrated alcoholic solution of naphthalene red is boiled for a few minutes with zinc dust, a colorless solution is obtained; and if the flask is corked while full of the vapor of the alcohol, the liquid remains colorless, and the zinc settles to the bottom. If the flask is then shaken so as to wet the sides, and the cork withdrawn, the inner walls are instantly colored deep red. It is only necessary to boil again, in order to repeat the experiment.

Liquid Phosphoretted Hydrogen.—A thick walled U tube, about one seventh of an inch in diameter, and provided with a stopcock on each arm, is surrounded by a freezing mixture ($-16°$ to $20°$), and receives the phosphoretted hydrogen prepared from 7 to 10 drams of freshly made calcium phosphide. A wide glass tube in the cork of the generating flask, dipping beneath the surface of the water (at about 60°), serves for the introduction of the phosphide. While the liquid is being collected, spontaneously inflammable phosphoretted hydrogen escapes; if this is displaced by a stream of carbonic acid, the bright flame is replaced by a scarcely luminous green flame, of so low a temperature that a taper cannot be lighted at it. This flame is caused by the liquid phosphoretted hydrogen in the stream of carbonic acid coming in contact with the air. The carbonic acid may be replaced by a stream of some combustible gas, for example, hydrogen, and a luminous flame again obtained.

Point of Maximum Density of Water.—The apparatus consists of a tall cylinder and a pear-shaped glass float, which is so weighted (with mercury or otherwise) that when immersed in distilled water, at $+39.2°$ Fah., it neither sinks nor floats. On cooling or heating the water in the cylinder, the float rises to the top or falls to the bottom.

Sodium Press.—The sodium is placed in a metal cylinder, at the lower end of which is a fine opening, and forced through by a screw. If it be received in mercury instead of rock oil, a pure amalgam may be readily formed.

Leidenfrost's Experiment Reversed, to Explain the Action of the Alkali Metals on Water.—When potassium is thrown in water, the hydrate formed by the reaction swims about on the water for a few seconds, in the form of a red hot globule, and then disappears with a sudden explosion. The manner in which this effect is produced may be illustrated by the following experiment: An ellipsoid of pure silver (weighing about 150 grains) is provided with an ear to which a stout copper wire is fastened. If it be heated to redness and dipped into water in a large beaker, it remains passive for five or six seconds, and then a violent explosion suddenly takes place, scattering the water, and usually shattering the beaker.—*A. W. Hofmann.—Deut. Chem. Ges. Ber.—Journal of the Chemical Society.*

THE yield of precious metal from the Pacific slope during the last quarter century is found from an aggregation of the various yearly returns to be in value $1,534,280,000. The product for 1873 was 14 per cent greater than for 1872, amounting in value to $77,440,000.

THE FAIR OF THE AMERICAN INSTITUTE.

As compared with its predecessors of the past three years, the present Fair is undeniably far in advance, not only in the number, variety, and intrinsic beauty and merit of the articles exhibited, but in the unwonted vigor which has characterized its management. With some trifling exceptions, the display is now complete, and that this can be said in the presence of the fact that an unusually large amount of heavy and bulky goods have been entered is no small credit to the gentlemen whose exertions have brought about so excellent a result in so short a period of time.

It is the verdict of almost every visitor that the general appearance of the hall has been greatly improved. The various articles have been grouped with an eye to artistic effect as well as to convenience, a task all the more easy owing to the entry of so many objects of elegant and tasteful design. As we before intimated, the display of red, white, and blue drygoods on the roof mars the general effect; but this aside, there is plenty upon the floor to gratify the most fastidious taste. Few art lovers can pass the cases of the Gorham Manufacturing and the Meriden Britannia Companies without a long look at the exquisite designs in silver and gold therein exhibited. There are some miniature models of yachts, and one tea set in gold and frosted silver which will well repay more than a passing glance, for the work upon them is admirable. As another very beautiful specimen of somewhat similar labor may be mentioned a copper lectern in the form of an eagle, to be found in the exhibit of Messrs. J. and R. Lamb, church furniture manufacturers and decorators. The modeling of the bird is very fine, and the way in which it is mounted to serve its purpose is quite artistic. In fact, it seems to us that the fine art department of the present Fair is scattered throughout every division, and exists everywhere but in the special quarter set aside under that name. The photographic display is little more than a repetition of that of last year, and there are some pictures present which have done similar duty for several years. Kürtz has some excellent photographs, as usual; Prang, one chromo among others which is especially good, and worth mounting a long staircase to look at: it is a child holding a bunch of flowers. And there are some fair specimens of photo printing, and work by the sand blast process, which has been described so often.

THE HORTICULTURAL DISPLAY

is exceptionally good. There are a number of admirable specimens of fine fruit, so large and luscious that one is forced to regret that their fate is to decay on their plates, and not to gratify somebody's palate. Several prominent florists in this city have sent some exquisite baskets of cut flowers, one of which, made of oat straw in the form of a bird house, stuffed humming birds perched here and there answering for the living inmates, is remarkably beautiful —and doubtless costly in proportion. The exhibition of growing plants is worth examination, as many rare and beautiful varieties are included. There is one specimen in which the very large leaf is half green and half pure white, and others look as if some one had shaken a brush full of white paint about their verdure. We do not remember to have seen any scientific explanation of this peculiar appearance, and it might be a subject for study as to why the chlorophyll or coloring matter of the leaves should thus be absent or inoperative in certain spots. From the main hall we proceed to note the novelties in the Machinery Department. A curious machine is that for

MAKING CORRUGATED ELBOWS

in stove pipes. The sheet of iron, bent in tubular form, is slipped over a mandrel of suitable size. In the extremity of the latter are two clamps, each made in two pieces, hinged opposite to each other. The inner clamp, when brought over the pipe and its halves forced together by a lever on one of them, makes a slight, narrow swelling around the surface of the pipe. The other and outer clamp has a square inner edge, which forms a crease or plait on top of the iron and outside the elevation formed by the first mentioned clamp. Both clamps are securely fastened, and a powerful lever in the rear is worked, which bends the outer edge of the pipe upward. The clamps are then loosened, and the return motion of the lever operates mechanism to carry the pipe a certain distance forward. The operation is then repeated until the pipe is bent to the proper angle. The machine is made by the Corrugated Elbow Company, of this city. It is operated entirely by hand, doing its work with great rapidity and accuracy.

A MACHINE FOR CUTTING OUT CLOTHES,

the invention of Mr. Albin Warth, is a remarkably ingenious apparatus, which bids fair to prove a great blessing to the tailoring trade. There are two forms of the machine, one of which is movable and is carried against the cloth, while the other is stationary and has feed wheels drawing the fabric to it. In the movable device, a long rod is fastened along the edge of the table, serving as a way for a traveling carriage. A belt passes over two pulleys at one end of the rod, and its bight over a single horizontal pulley at the other, and to this power is applied. On the carriage is a pulley, against which the two parts of the belts, passing it on each side, are forced by means of binder wheels, the degree of pressure applied to the latter regulating the amount of power transmitted from the belt to the pulley. Just above the latter, and on the same shaft, is a smaller belt pulley, and above this again is pivoted a long arm, which extends out over the cutting table. Another belt for the smaller pulley passes along the arm, thence to other pulleys, which it rotates, so communicating motion to an eccentric, which gives a knife in a suitable support a fast vertical reciprocating motion. Below the knife is a flat metal disk, with beveled edges, which is passed under the cloth. The part which holds the knife has a handle, by which the operator can guide it, the arm being pivoted on the carriage, and the latter having a free motion along its way, affording a kind of universal movement over the plane of the table. There is a presser foot that holds the cloth, and devices for instantly shifting the driving belt in the movable part to a loose pulley, and so stopping the operation. The machine cuts through half an inch of solid cloth with the utmost ease. No pinning of the material is necessary, and the inventor informs us that, in many of the largest clothing manufacturing houses in the city, forty men are readily enabled to do the work of one hundred. In the smaller or stationary machine, there is mechanism under the table to give the knife working through the same a reciprocating motion, and also to operate feed wheels, which draw the cloth against the edge. This cuts through 1½ inches of solid cloth, and we are told that with it four men can easily fold, sketch, and cut 800 pairs of pants, or 500 coats, in a working day. There are very many ingenious and interesting details about these machines, which will well repay examination.

Considerable interest is being excited by the performances of the new lubricant,

METALINE,

a substance which we described and illustrated some months since, and which has proved successful as a substitute for oil in a variety of machinery. The material is a peculiar alloy which is inserted in cavities made in the interior of the journal boxes, and its effect is to form a thin film over the opposing metal surfaces, and to prevent either heating or cutting. At the Fair is exhibited a counter shaft, speeded to 750 revolutions, in which the bearings are cut down to the diameter of the shaft, one inch. This communicates motion to a short emery grinder spindle, speeded to 3,500 revolutions, and the latter to a cotton spindle, which runs at 14,000 revolutions. There is not the slightest cutting visible under these very high speeds, and the amount of heat developed is barely discernible by the touch. The Fall River mill, which was burned through friction generated by an unoiled mule head, would doubtless be standing to-day had such a substance as this metaline been employed.

Next week we hope to have room for a longer report of the Fair.

MEDICAL NOTES.

Kousso for Tape Worm.

A correspondent of the *Druggists' Circular*, F. R. P., of Augusta, Me., narrates a case where he effected the removal of a tapeworm after the patient had taken male fern, turpentine, and a number of other remedies, prescribed by different physicians, without avail. First, a dose of castor oil was given at night; it operated early in the morning. Then one ounce of pulverized kousso was put in half a pint of warm water and allowed to stand a short time. The patient drank what he could of it in twenty or thirty minutes. He retained about one half the quantity used, his stomach rejecting more. In three or four hours he took another dose of castor oil, meanwhile having an operation from the kousso, but no tapeworm put in an appearance. But in an hour and a half the last dose of oil operated, and with it came twenty feet of the tapeworm in one unbroken piece, the head remaining, the end coming first being half an inch wide, and the last portion about one sixteenth of an inch wide, evidently being very near the head. Some two weeks after, the same treatment was repeated, only the kousso was given in capsules instead of water. This time eight inches more of the troublesome tenant were dislodged, one end running down to the size of a knitting needle, and the joints almost square. Several physicians say the head must have passed. The patient feels much relieved in mind and body, and has already begun to grow fat. The prescriber finds the books vague, and desires some one to give him a plain description of the head of the *tænia solium*.

Styrax in Itch.

At the Stuttgard hospital, they treat *scabies* with the following ointment: Styrax, one ounce, olive oil and common spirits, each one drachm; mix. If an old case, the patient is first washed thoroughly with soft soap, nine to twelve times in three days, and then anointed with the above, one to three times a day. In recent cases the soft soap is not required. In 1,659 cases thus treated, every one was cured, although no precautions were taken to destroy the insects on clothing, and not one relapse occurred.

Surgical Treatment of the Eye.

Mr. C. S. Jeaffreson, surgeon of the Eye Infirmary, Newcastle-on-Tyne, makes very important remarks on the treatment of the eye when injured or diseased. He says: "There is one rule in ophthalmic surgery which will help us to deal with a large class of these cases, and it is this: An eye which has been damaged by accident or disease, and which is no longer useful for visual purposes, is a dangerous organ and should be removed. I do not wish to assert that this rule should always be rigidly carried out as regards eyes which have been destroyed by idiopathic disease, although I think, in those cases, a rigid conformity to it would rarely carry us astray. In traumatic cases, I firmly believe that it can never be safely departed from, and should be carried out as soon as we have convinced ourselves that the visual power is gone, or will be so low as to be practically useless. Scarcely a day passes in my public or private practice without my seeing a case of sympathetic ophthalmia, which might have been averted had this rule been thoroughly understood by the bulk of practitioners; and every year a large number of persons are consigned to a life of darkness and misery from a want of appreciating the importance of it. Patients have a great horror of enucleation, and require usually a great deal of pressing to submit to it; and for this reason the surgeon must be firm and unflinching, and must indicate the necessity for action in the most forcible language. What should guide our treatment in doubtful cases? In my judgment, the following circumstances: 1. If there are the slightest signs of sympathetic ophthalmia in its fellow, the injured eye should be immediately excised. 2. If vision is absolutely lost beyond hope of recovery, the eye should be sacrificed. 3. If the wound is in the ciliary region, and there is no prospect of really useful vision, the eye should be excised. 4. If the wound is not in a dangerous region, and the impaired vision seems to be in a great measure due to effused blood, I should not advise immediate operative interference. When once we have made up our minds that enucleation is necessary, is it advisable to wait till acute inflammatory symptoms have in a measure subsided? For my part, I think not. I have frequently performed enucleation during the most inflamed stages, and I never have seen any bad results follow. I believe that by following this rule, we may frequently curtail a great deal of pain and anxiety, which would have been incurred by waiting.

When foreign bodies are lodged in the anterior chamber, lens, or iris, they are generally clearly visible, and may usually be removed without much difficulty while the structures are still transparent. When they are lodged in the lens, no time should be lost, for sometimes it happens that a body which remained *in situ* while the lens was firm disappears behind the iris when the lenticular matter becomes diffluent; and if extraction be attempted at this period, especial care must be employed, as the lenticular matter not unfrequently flows out, leaving the foreign body hidden by or entangled in the folds of the iris. Occasionally a foreign body which has been lodged in the eye will escape spontaneously.

SIR JOHN RENNIE, the distinguished civil engineer, died on the 3d of September, in England, at the ripe age of eighty years. He constructed the new London Bridge, completed Plymouth Breakwater, designed and built Sheerness Dockyard, Ramsgate Harbor, parts of the Cardiff Docks, and other important works.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

PATENT FRUIT JAR.—THE CONSOLIDATED FRUIT JAR COMPANY *vs.* JAMES T. WRIGHT.

WOODRUFF, *Circuit Judge:*

The bill is filed herein to restrain the alleged infringement of a patent granted May 10, 1870, to John L. Mason for "an improvement in fruit jars," and, by assignment, now held by the complainant. The application of Mason for the patent was made on the 15th of January, 1868.

In the specification the invention is said to relate to a new and improved construction of jars and other vessels designed for the preservation of fruit and other substances which are seriously affected by exposure to air, whereby india rubber packing rings or gaskets can be employed in making tight joints without exposing the rubber to the contents of the jars, and whereby flat horizontal shoulders, formed outside of the jars, are adapted to afford bases, upon which to receive said rubber packing rings, upon the exterior of the jars above the continuous glass screw; and whereby flanged caps or covers can be used, the flanges of which are adapted to fit over annular ribs or flanges surrounding the mouths of the jars; and whereby flexible flanged screw rings, made of thin metal, are adapted to confine the caps or covers down firmly in place over the months of the jars and upon the said rubber packing rings, placed upon the said shoulders formed outside of the jars.

After a more minute description and reference to the drawings annexed to his specification, the patentee states that he claims:

The combination, first, of the shoulder *b*, to receive a gasket outside and a little below the top of the jar; second, of the cover B with the rim *d* extending down outside of the top to press upon the gasket; and third, of the screw ring or screw cap C, with its screw threads operating upon those of the jar below the gasket shoulder, all substantially as above set forth and described.

It is to be noticed that the patentee does not claim either of the elements or parts of this combination; nor does the patent purport to secure to him the exclusive right to use either, nor does it secure to him the special form of either, but only the combination of the three.

The patent, therefore, in no wise hindered the use by any one of a cover having a rim or flange extending down outside of the top of the jar to press upon a gasket, nor of a shoulder upon the outside of the jar, a little below the top, to receive such gasket, nor of both of these combined, provided the purpose was not produced by a screw ring whose threads operated upon threads in the glass jar below the gasket, and so of any other jar not combining the three parts. The patent is strictly a combination patent, in which the parts are not claimed to be new. *

Held as follows:

A patent for a fruit jar claimed in combination an outside shoulder below the top for holding the gasket, a cap with a rim pressing on the gasket, and a screw ring engaging with threads below the shoulder for holding the cover down; and it disclaimed a gasket which was pressed down upon a similar shoulder by means of a clamp as well as a similar screw ring for holding a gasket on the top of the jar. Doubted whether there was the exercise of anything more than sound judgment in substituting the screw ring for the clamp in one case, or the gasket on the shoulder for the one on the top in the other.

Where a patentee disclaims so many elements of his invention as to leave no room for the exercise of invention in forming the combination which he claims, it is of no avail for him to show that he was really the the first inventor of all or any of the parts thereof.

A patent is void if more than two years before the application for it was filed the patentee had sold the patented articles for the double purpose of realizing the proceeds and of seeing if they would sell, and others had had them in actual use.

An invention held to have been abandoned to the public when the author, after having reduced it to perfection and actual practice, took no farther measures with it for nine years and suffered the molds to be lost, and meanwhile others, independently of him, reduced it to practice and introduced it extensively into market.

It is not necessary that the latter should obtain a patent; it is enough if they have reduced the invention to practice, and it has gone into use.

The first inventor does not lose his right in such a case in consequence of the mere lapse of time, but because the circumstances indicate an intention of abandonment, and because the rights of others have intervened.

Bill dismissed with costs.

[*A. J. Todd* and *J. H. B. Latrobe*, for complainants.
W. C. Witter and *George Gifford* for defendants.]

Inventions Patented in England by American

[Compiled from the Commissioners of Patents' Journal.]

From August 27 to September 9, 1874, inclusive.

BOILER FURNACE.—W. L. Powleson, San Francisco, Cal.
BOOT MAKING MACHINE.—E. P. Richardson, Lawrence, Mass.
BRAKE.—J. Y. Smith, Pittsburgh, Pa.
BREECH-LOADING FIRE ARMS.—B. B. Hotchkiss, Paris, France.
CAULKING TOOL.—J. W. Connery *et al.*, Philadelphia, Pa.
CUTTING BUTTER, ETC.—S. Richards, Philadelphia, Pa.
EQUALIZING PRESSURE.—W. Miller, Boston, Mass.
FILLING BOTTLES, ETC.—P. McC. Sherwood, New York city.
LEATHER CRIMPING MACHINE.—G. Platts *et al.*, Newark, N. J.
MAKING PAPER PULP.—H. B. Meech, New York city.
PAPER CUTTING MACHINE.—V. E. Mauger, New York city.
PIANOFORTE.—M. W. Hanchett, Syracuse, N. Y.
PILE FABRIC LOOM.—J. Cochrane, Jr., Malden, Mass.
RAILWAY CAR, ETC.—Revd. J. C. Nobles, Elmira, N. Y.
ROTARY ENGINE.—R. D. Milne, Los Angeles, Cal.
SOLDERING APPARATUS.—J. Sears, Chicago, Ill.
STEAM PACKING.—P. W. Richards, Boston, Mass., *et al.*
STOPPING BOTTLES, ETC.—N. Thompson (of Brooklyn, N. Y.), London, E.
SUSPENDING CHANDELIERS.—Bradley *et al.*, New York city.
TRAVELING BERTHS, ETC.—T. P. Ford, Greenpoint, N. Y.
TRIMMING BOOT SOLES.—H. E. Townsend, Boston, Mass.
UMBRELLA RUNNER.—J. J. Higgins, M.D., New York city.

Recent American and Foreign Patents.

Improved Sprinkling Nozzle.

Biddle R. Moffett, Swedesborough, N. J.—This invention consists of a nozzle with spout, cut off under suitable inclination, to be closed by a tightly fitting packing at the end of a spring lever, which is partially opened or closed by the hand to throw out the required quantity of water.

Improved Imitation Embroidery.

Henri François Timothée Mégrand, Paris, France, assignor of one half his right to Edward Vernon, same place.—A strip of any suitable fabric such as tape, is first impregnated with a strong gum, in order to impart the necessary stiffness. It is then cut on one or both edges, according to any desired pattern, by means of machinery already patented by this inventor. The strip is then passed through another machine, also patented by M. Mégrand, whereby it is covered with threads, which are wound by a rotating thread-carrying arm as it is drawn through the machine; or the strip may be covered by a machine, described in another patent of the inventor, in which rotating arms wind threads around the strip at the same time that shuttles carrying other threads form with the first named a kind of woven edge to the strip. In either case, the surfaces of the strip are so covered with threads as to resemble satin stitch when sewed to any fabric.

Improved Curd Worker.

Willard C. Smith, Norway, N. Y.—To a shaft are attached wheels, to the rims of which are attached perforated sheet metal plates which form the curved wall of the cylinder. In the opposite sides of the latter are formed openings, which are closed by doors formed by attaching sheets of perforated sheet metal to suitable frames to stiffen them. By suitable construction the cylinder is revolved slowly, while a fan wheel is rotated rapidly so as to force a strong stream of air through the said cylinder. To wheels are secured longitudinal bars with cross pins to break up the curd as the cylinder revolves. The whey trough fits upon the lower side of the cylinder, and is so arranged as to be raised and lowered by turning the shaft. The upper edge of the end of the trough is notched directly above the spout, so that, should the trough overflow, the whey, as it runs over, may flow into the spoue, and thence into the receiving vessel.

Improved Corn Planter.

Francis Bolduc, St. Anne, Ill., assignor to Joseph Dalpay, same place.—The axle carries a bevel gear wheel with it in its revolution, and thus gives motion to gear wheels, pins on which strike alternately the rear ends of the forks of a lever at each revolution, thus oscillating the same. The lever is pivoted to the frame, and its forward end is attached to the center of the slide bar, the ends of which enter the seed hoppers and connect with the dropping disks, operating them to drop the corn. The size of the dropping openings, and consequently the number of kernels dropped at a time, may be regulated at will. By the downward movement of a bar, the driver can determine the exact space passed over by the machine while the dropping device is out of gear. This enables him to throw the dropping device out of and into gear at such times as will cause the hills to be planted in perfect check row.

Improved Hot Air Furnace.

David Boyd, New York city.—The products of combustion pass up through a dome space into a flue. The upper compartment is occupied by a concentric flue which communicates with the flue first mentioned at the center of the compartment, and also at the periphery or outside. A pivoted damper is located in the latter, between the inner and outer portion of a flue, to cause the products of combustion to take either a circuitous and return course or a direct one, thus, in large measure, controlling the degree of heat radiated by the heater, and also the rapidity of combustion.

Improved Game Board.

John Butt, Brooklyn, N. Y.—This is a toy ten pin alley, in which the ball ay be projected, by a spring plunger hung upon a pivot against pins placed upon a table, knocking down more or less of them according to the skill exercised in aiming.

Improved Spike Extractor.

Michael Biglin, Pleasant Valley, Pa.—The spike hook is of hollow shape with a recess in the bottom part, the sides of the latter being tapered off toward the recess, so as to be placed under the projecting parts of the spike head and close around the shank. A curved hook-shaped rail plate fits over the top part of the rail, and forms the fulcrum, by which the lever turns when raising the spike. The straight upward motion of the hook draws the spike completely out of the cross tie without breaking or injuring it, so that it may readily be used again.

Improvement in Treating Cotton Seed Oil for Paint.

Henry Goldmann, New York city.—This is a process of converting cotton seed oil into a drying oil by adding aqua regia, bisulphuret of carbon, d sulphate of baryta, and by heating and agitating the liquid compound.

Improved Water Wheel.

Jeremiah J. Dodson, Greensborough, N. C.—This consists of a wheel made with buckets whose width increases from the central conical entrance part toward their middle sections, and diminishes toward the issuing ports the circumference. The water enters through diametrical chutes at the op, and an enlarged water space of the cap piece, to the conical center nd the buckets. A considerable pressure of the water in the buckets is thereby produced, and the wheel rotated with increased utilization of the power of the water head.

Improved Dust Catcher for Thrashing Machines.

Rudolph Z. Bader, Papillion, Neb.—This invention consists of side tubes or channels, which pass at both sides of the thrasher to the fan openings and are tightly attached thereto. A laterally connecting tube passes in front of the cylinder, and is connected with a detachable center piece having perforations at the bottom and side facing the cylinder, for the purpose of drawing in the dust produced by the feeding operation and the cylinder, and conducting the same, by the suction of the fans through the side tube, to the rear part of the thrasher.

Improved Door Securer.

Augustus Rebetey, Newark, N. J.—A face plate is applied by an inner flange and the spring to the hasp, the door being open at the time. The door is then closed and a sliding bolt carried forward over the lock as far as a rear shoulder or projection of the same admits. This shoulder passes along the outside of the hasp to or nearly up to the rim of the same, and throws the bolt with wedge-like pressure on the lock, forming a strong, safety device to the same, by resisting any attempt to open the door from the outside.

Improved Car Coupling.

William M. Underhill, Oconto, Wis.—Each drawhead has a hook above and a printed link below. Before coupling, the links are thrown back; and when the cars come together the concussion is sufficient to cause the links to swing forward and catch over the hooks. Spring pushers also arranged in the drawheads then force the cars apart, tightening the coupling.

Improved Automatic Gate.

Jefferson Ellis, Detroit, Mich.—By suitable construction, when the platforms and cross bar, which form the base of the gate, are forced downward by the weight of a horse, carriage, or other object passing upon them, the downward movement of rack bars will turn gear wheels, and thus raise or open the gate, which gate will be held raised until the platforms are released from the depressing weight, when the elasticity of the springs underneath will raise the cross bar and platforms to their former position, closing the gate.

Improved Compound for Cough Sirup.

Jesse G. Coombs, Millville, N. J.—This consists of tincture of lobelia, tincture of myrrh, tincture of capsicum, tincture of blood root, alcohol, oil of anise, and wintergreen, mixed with molasses.

Improved Washing Machine.

Gille F. Lecrenier, Stockport, N. Y.—This washing machine is formed of a large fluted or corrugated roller, and a series of small rollers with a suitable arrangement of springs to exert the requisite pressure on the clothes as they pass between the rollers. Extension leaves are supported in horizontal or inclined position during the time the washing machine is in use, for conducting the clothes over the feed roller and leaf to the main and friction rollers without injuring and squeezing the fingers.

Improved Draft Equalizer.

Henry H. Stevens, Riley, Ill.—To the rear side of the draft bar is bolted an iron bar, in which are formed holes to receive the draft, one of which is in the center line of the lever, and the others at different distances upon each side of said line, so that, by changing the point of draft attachment, an advantage of leverage may be given to one of the three horses or one pair of the four horses. To the under side of the end parts of the lever are pivoted two pairs of pulleys, and to the upper side of the middle part is pivoted a third pair of pulleys, upon the opposite sides of, and equally distant from, the center of the lever. There are three tugs, one of which is passed around each pair of pulleys, and to their ends are attached the traces. To the right hand ends of the right hand and center tugs are attached the traces of the first horse. The traces of the second horse are attached to the left hand ends of the said right hand and center tugs. The traces of the third horse are attached to the ends of the left hand tug; or the hitch may be reversed by commencing with the left hand horse. By this construction, by changing the point of draft attachment, the third horse may be made to draw more or less than one third of the load, while the two other horses will draw equally.

Improved Lathe.

John H. Sinkinson, Newark, N. J.—In order to apply spool blanks automatically to the lathe, and thus save the labor of feeding them by hand, a pair of spring fingers are employed, connected to a collar, so as to slide out and back on said arm, and open and close. The collar has a spring to pull it back, and an arm for forcing it out by running over a cam on a disk. When the spring pulls the fingers back, it opens them; and when they are pushed out by the cam, they close on the blank and hold it. The spool blanks are delivered to the fingers from the vertical conductor, into which they descend from an inclined conductor, one being let fall into it each time the fingers come to their position under it. The arm, on which the carrying fingers are mounted, is mounted on a rock shaft, which is turned by a tappet, to swing the carrier down between the lathe centers to present the block to them; but just before the carrier is thus swung down, it is pushed outward along the arm by the cam, so as to extend it to reach the spool blank to the axis of the lathe, and also to allow the fingers to escape from the spool blank by sliding back on the arm after the blank is secured. The arm escapes from the cam the moment the spool blank is secured by the tail center and swings back to the place for receiving the blanks.

Improved Car Brake.

Charles Mathews, Fredericksburgh, Ohio.—This invention consists in connecting the main or central brake lever of the series to the bottom of the car by a flexible medium, to adapt it to coöperate with the other parts of the brake mechanism, with minimum strain and friction. By the turning of the brake rod at either end of the car, the brakes or rubbers are simultaneously applied to the wheels by means of the symmetrical lever connections of the main lever and brake bars.

Improved Oil Rock Preserver.

Henry A. Snow, St. Petersburgh, Pa., assignor to himself and Wesley Chambers, of same place.—This is an oil rock preserving tube, incasing the pump, whereby the water column below the influence of the suction will maintain the oil, or oil and water, as high as the top of the oil rock, or thereabout, to protect it from paraffin deposit. There is also a water packing, in combination with the oil rock preserving case, to prevent the flow of the oil to the pump under or through the lower portion of the case.

Improved Combined Hand and Standard Mirror.

Abel M. Rontey, New York city.—This invention consists in the handle of a hand mirror, made in three or more parts, hinged, all or part, at their upper ends, to adapt them to be opened out to serve as a stand for the mirror. The upper ends of the two rear parts of the handle are hinged to each other by a hinge, so that their lower ends may be spread apart.

Improved Churn.

Thomas H. Herndon, Verona, Miss.—A pail or can with closed top is simply made fast in each one of the hollow heads of a box, which is then rotated by clockwork mechanism, arranged in a suitable frame, until the butter comes.

Improved Spring Back Rest for Vehicle Seat.

John L. Giessler, Clinton, Iowa.—This invention relates to novel means whereby the jar, shock, or jolt to the back of an individual, resulting from the sudden starts of horses in a vehicle, or from unevenness in the roads, may be completely taken up and neutralized. The invention consists in providing the seat of a vehicle with a pivoted back and spring arms.

Improved Test Valve.

Edwin A. Wood, Utica, N. Y.—The nature of this invention consists in giving to the valve opening a definite area, as, for instance, a square inch, and loading the valve so that it will be equal in pounds to the pressure at which the steam or pressure gage is to be tested, with the parts so arranged that, when the slightest pressure greater than such weight operates on the valve, it will instantly rise; and if the gage to be tested is attached to the same pump, the index on the gage will, at the instant the gage rises, show whether the gage is correct or not.

Improved Machine for Graining Pails.

Lyman Jennings, Winchendon, Mass.—This invention consists of tapered printing and inking rolls, and a roller block for holding the pails, etc., combined and arranged to apply two or more colors to a pail or tub. The type rollers have type portions and vacant spaces, and they are so geared by a wheel, which also turns the block supporting the pail, that the type of one roller prints in the spaces left by the spaces of the other roller. As the ink rollers have inks of different colors, the patterns are thus applied to the pails in alternate order, when two printing rollers are used. By the same plan, three or more printing rollers may be employed.

Improved Neck Yoke.

Michel Krebs, Assumption, Ill.—This is an improved neck yoke, by which the wearing out of the breast straps, both on the flat side and the edges, is prevented, while it allows the breast straps to work freely, and obviates the jerking of the horse's neck and the injury frequently caused by it. The invention consists of a bracket attachment to the ends of the neck yoke, which supports a loose roller, and side washers for the ready adjustment of the breast strap.

Improved Wash Boiler.

Joseph H. Jenkins and Elijah W. Jenkins, Liberty, Mo.—To the side edges of the cover of a square metal-lined wooden box, near its rear edge, are provided short rods, the lower ends of which are pivoted to the sides of the box. The pivoted rods thus serve as hinges to the cover, and also enable it to be slipped forward after being turned back, so that its rear edge may project over the boiler, to conduct the water draining from the clothes back into said boiler. The movement of the pivoted rods is limited by two stop pins. The cover, when turned back, is supported by an arm or bracket, detachably secured to the box.

Improved Ball and Instep Stretcher for Boots, etc.

Frank A. Fay and Rudolph Spahn, Brooklyn, N. Y.—Two side pieces, arranged between a bottom piece and the instep piece, and pivoted at the heel, are provided with a tapered screw plug, a little in advance of the pivot for forcing them apart at the ball for stretching it. A divided nut is formed, half in each piece, for the plug, and the plug is provided with a stem and a handle for turning it. The instep stretcher is pivoted to the bottom piece at the toe, and it is connected behind the instep by a yoke to the nut of a hollow screw resting on the stand, which is supported on the bottom piece. This hollow screw surrounds the rod and allows it to extend down in the same axis to the plug, and it has a handle for turning it. This forms a stretcher both for the ball and instep of a shoe.

Improved Hedge Trimmer.

Andrew J. Heavner, Pittsfield, Ill.—The rear end of the frame, being suspended, may be raised and lowered, as desired; and by operating a lever the forward part of the suspended frame may be raised and lowered as required, and, when adjusted, will be held securely in place. A sickle bar, which is made in two parts, meets at the angle of the cutter bar and works in bearings in the rearwardly projecting ends of some of the fingers, or in bars attached to the cutter bar. Each part of the sickle bar is vibrated by a zigzag wheel, which works in notches formed in the said sickle bar. The zigzag wheels are attached to shafts, which work in bearings in the rearwardly projecting ends of some of the fingers.

Improved Running Gear.

Celestin Jackman, Georgia City, Mo.—This invention consists of a connection of a bolster, by a concave wheel, with a convex follower and a pivoted brace attached to the front axle and the pole. The king bolt forms the connection of axle and bolster, and may, in smaller wagons, be entirely dispensed with; while, in heavier wagons, the same forms, in connection with the sliding wheel and follower, perfect security of the king bolt coupling.

Improved Bung Hole Lock.

Carl Faubel and Friedrich Knorr, New York city.—This invention consists of a lock plate attached to the bung hole, which is provided with a hinged hermetically sealing bung hole cover, to be locked by a suitable bolt, and retained in open position in a recess of the base plate by a band spring catching thereon. The device dispenses with the use of bungs and the injury to the barrel by driving them in.

Improved Locomotive.

Thomas Benton Smith, Nashville, Tenn.—The object of this invention is to prevent the drive wheels of a locomotive from slipping upon the rails by using the weight of the train being drawn to give a downward pressure upon the said wheels, causing them to hug the rails, thus increasing the traction power of the locomotive. Pivoted bars extend along the sides of the locomotive, and connect with longitudinal bars passing under the tender and fastened to the first car. At the joints of the first mentioned bars are connected vertical rods which communicate with the piston of a steam cylinder situated above the locomotive. With this construction, when the engineer admits steam into the cylinder, the piston is forced upward, drawing the bars upward into an angular position. The weight of the train then tends to draw the bars downward into a horizontal position, which throws the weight of the train upon the drive wheels of the locomotive, causing them to hug the rails.

Improved Roller Skate.

John Fenton, Indianapolis, Ind.—The wheels revolve in forked bracket pieces attached by loose rivet connections to hinged plates. Bed plates are provided on each side with wedge-shaped ears which extend down on each side of the skate. Rubber springs allow the foot piece to rock from side to side, while the wedge-shaped ears keep the brackets and wheels in position. On the weight being thrown upon either side, the skater is enabled to turn and change his course at will, and perform all the movements and evolutions on a smooth floor that he could on ice with the ordinary ice skates.

Improved Metal Planing Machine.

Joseph L. Hewes, Newark, N. J.—A case is attached to the bed with a cap screwing on the front face, to enclose the worm gears to protect them from dust and to hold oil. There is a fast pulley and a loose one for the belt which gives a forward motion to the bed, and the same for the belt for giving the back motion. The shifters are alike in form, but reversed in position, and have a loop at one end, to receive the belt, and a notch at the other, which latter interlocks with angular projections on a slide, while the side faces of the slide act upon the sides of the levers at points opposite to the notches. In the slide are spaces which allow it always to move so as, by one projection, to shift one belt from a fast pulley before the face of the slide begins to shift the other belt from the loose pulley.

Improved Grain Separator.

John T. Hicklin, Olympia, Wash. Ter.—There is a horizontally shaking shoe in which fingers are mounted for separating the straw, chaff, etc. Said fingers are pivoted at the upper end, and rests near the front end upon a bar, so as to be allowed to rise and fall. A bar attached to the under side of the fingers carries a couple of cams on its under side, which, in passing forward and backward over rollers on fixed bearings supported on the case, give to the fingers a quick up-and-down motion in addition to its horizontal motion with the shoe, which increases its efficiency in separating the light matters from the grain.

Improved Curtain Fixture.

Charles E. Howard, Philadelphia, Pa.—This device is used in connection with curtains secured to rings which slide on wires. A cord passes through a pulley on the window case, thence up through a pulley secured at one end, and above the curtain wire, thence along the same around a second pulley at the opposite end, back and over the same route to the first pulley, where the ends may be secured together. One end of one curtain is attached by a clamping ring to one part of the cord, and the similar portion of the other curtain by like means to the other, so that, by pulling one or the other lower end of the cord, the curtain may be brought together or opened.

Improved Milk Receptacle.

George C. Greenleaf, Moira, N. Y.—This invention relates to a means of cooling and preserving the sweetness of milk; and consists in a milk pan fastened to a frame with a second frame or tray divided into compartments by partitions. Said pan rests upon these partitions, and into the central compartment formed thereby is introduced cold water, which, after cooling the central portions of the milk, circulates, through holes in the partitions, around the edges of the pan, and is finally discharged through an outlet.

Improved Molding Flask for Cement and Clay Pipes.

Joseph F. Andrews, Nashua, N. H.—The core is constructed of two parts, which are connected horizontally by a tapering socket joint, the lower or bottom part of the core having a large flange, which is secured to the bed plate of the mold, so as to support the same in an upright position. The cement for forming the pipes is filled in from the top, the end section being then placed on the top end and pressed on the material after the mold is completely filled. After the pipe is sufficiently dry the upper core section is drawn out by suitable hoisting mechanism, the lower core being drawn out in the opposite direction by hoisting end section, pipe, and flask, which produces, by the draft of the core sections from the center, a smooth core, of equal diameter along the full length of the mold. The top and bottom sections remain on the pipe until the ends are perfectly dry, when the outer flask and end sections are removed.

Improved Machine for Facing Tiles.

George Barney, Edward P. Parsons, and Rufus L. Barney, Swanton, Vt. —The rubbing disk is cast in sections with a recess in the center, and the sections are locked together by dovetail notches and projections to prevent them from throwing off by centrifugal force. A vertically adjustable center piece is fixed on the shaft by a collar and a set screw, over the central recess, for shifting down as the disk wears down and to be kept level with it. A friction wheel on the upper part of the shaft turns another shaft by a wheel to revolve the tiles upon the disk, the tiles being confined in holders connected to the lower end of the shaft by bars. The shaft is supported in bearings in the arms of another shaft, on which it and the holders are swung from a platform or table, after receiving the tiles on the disk, and back again for applying the stones to the disk and removing them. The last mentioned shaft is stopped in a bearing in the short arm of a foot lever, so as to be lifted a little, to take the weight of the tiles off from the table and disk, so that they will swing free in turning forward and backward.

Improved Car Coupling.

Leonard Fleckenstein, Creswell, assignor to himself and Martin Miller, Highville, Pa.—This invention consists of two spring bars with arrow heads, which interlock firmly with similar heads of the connecting coupling. The spring bars are pivoted to a standard at the bottom of the car and supported in a surrounding guide piece with vertical spring rod, having operating treadle and adjusting mechanism for uncoupling, raising, and lowering the coupling arrow heads. When the arrow heads are adjusted and centered correctly, they will couple automatically on the approach of the cars, and may be instantly and readily uncoupled by the action of the foot on the treadle, or, in case of accident, by a change of their relative position.

Improved Automatic Fan.

Paul Magnus, New York city.—This consists of two fans attached like wings to a vertical spindle, which is rotated by suitable mechanism in a pedestal case. The apparatus moves without noise and is a convenient portable device for cooling the person.

Business and Personal.

Charge for Insertion under this head is $1 a Line.

ANSWERS TO CORRESPONDENTS

(1) J. M. says: We have attached to pipes laid in our streets for fire purposes, a steam pump, which takes water only on the upward stroke. The diameter of the water cylinder is 10 inches, and the length of stroke is 6 inches. The supply comes from a pond which is 430 feet distant, and the surface of the water is 15 feet below where the pump stands. The suction pipe is 6 inches in diameter and has three right angled turns in it. The pump works finely up to 100 revolutions per minute, but, if run faster, it pounds, and we do not get any more water. The makers say the suction pipe should be larger. I do not see it. In looking over the sizes of suction pipes used by different makers, I find none larger than 6 inches on a 10 inch water cylinder, and some use a 5 inch pipe. If the pumps need larger pipes, why do they not make the connections to them larger? I find by using a vacuum gage that this pump will create a vacuum equal to a column of water 25 feet high. Now take out the 15 feet the water has to rise in reaching the pump, and allow 8 feet to over come the friction of the pipe; we still have a head of 2 feet which (according to Box) would give an actual discharge of 662 gallons per minute, while all we get through the pump is 204 gallons per minute. There is no trouble in the pump, as the valve area and water passages are all greater than the area of a 6 inch pipe. I put a chamber on the pipe near the pump; this made it work better. We want to run the pump at least 200 revolutions, and get all the water such speed should give. There is no leak in the suction pipe. Would a pump that receives and discharges water at both strokes work any better on this pipe? A. The pump seems, from your account, to be performing very well. A larger pipe would, of course, help matters somewhat, by reducing the velocity with which the water flows through the pipe, and effecting a consequent reduction of the head. An ordinary double acting pump would probably draw more water through the present pipe. It seems as if you had taken too low an estimate of the friction of the pipe, since, if the pump is all right, the trouble must be in the pipe.

(2) J. M. asks: I have been trying to get some aldehyde ammonia (described in *Science Record* for 1872, in Liebig's process of silvering glass, as improved by R. Siemens). How is it made? A. Ammonia aldehyde is best obtained by the action of chromic acid upon alcohol. Equal weights of powdered bichromate of potash and strong alcohol are introduced into a glass flask provided with a safety tube, and placed in a sand bath; 1½ parts of sulphuric acid are gradually added by the safety tube. Much heat is produced by the mixture, and the distillation commences at once, but is continued by a gentle lamp heat under the sand bath. The vapor is conducted through the worm of a condenser, surrounded by ice water. The impure product is mixed with ether and saturated with ammonia, when ammonic aldehyde separates in fine crystals. The apparatus should be made entirely of glass.

(3) O. J. P. says: A person living three miles below Montreal wishes to draw water from the river St. Lawrence, by means of an ordinary brass pump 3 inches in diameter, with an iron pipe 1½ inches, and 200 feet long; but finding by past experience that, if he should run the pipes out into deep water, they are invariably broken every spring by the ice (which, in its yearly "shove," makes an immense pile resting on the river bottom, breaking the pipes and rising sometimes twenty feet above the water), I desire to know: 1. Could I, by placing a perforated barrel in an excavation, at a depth below low water mark, obtain water by its natural suction into the barrel? A. It would depend on the nature of the soil, and the easiest way to settle the matter would be to try the experiment. 2. For purposes of filtration, would it do to surround the barrel by a row of brick placed without mortar, then by another row of brick around and at about six inches from the former, and finally fill the space between the two rows of bricks with wood charcoal? Would there be any danger of the brick preventing the water from filtering through it, from the closing of its pores in the course of time? If, in making the excavation or hole, I should meet with a soapy kind of clay very usual on the north western shore of this river, and commonly called blue or red clay, might I expect that the water would filter through such clay? If it should so filter, would this water be pure and the same as the river water? If this plan would not do, would you be good enough to suggest another? A. It would not be necessary to have the brick wall. Use two barrels, putting the filtering material into one, and letting the water run into the other. The water would probably not filter through the clay. 3. How do you determine the right size of an eduction pipe of a force pump, say a common force pump of 3 inches bore with an induction iron pipe 1½ inches in diameter and 200 feet long, 20 feet above the water level, the reservoir in the house being at about 20 feet above the pump? Must I use 1¼ or 1½ inches for this eduction pipe? A. Use pipe suitable for connection on the pump. 4. I am to build a screw which will work under water by the force of the stream or current, which runs at the rate of about three miles an hour. This screw will be connected with two small submerged brass pumps, by means of gearing, to force up water for house or manufacturing purposes. The screw would be made of iron, 3 feet in diameter, making 5 revolutions to each stroke of the pump. The pump would be 2 inches diameter and 6 inches stroke, or 3 inches diameter and 6 inches stroke. Will this do? A. An undershot wheel would answer better. The plan is old, and not very efficient.

(4) L. L. asks: How can I determine accurately the strength of alcohol? A. Determining the purity of alcohol is what is known as alcoholometry. For the purpose of ascertaining the quantity of alcohol contained in a fluid which consists only of alcohol and water, the areometer is generally used. It is an instrument very similar to the hydrometer. The areometer of Tralle and that of Richter are most generally used. Stoppini's is similar to that of Richter. Both are centesimal alcoholometers and show, by the number of the degree to which they sink, the percentage of pure alcohol. The difference between these two instruments consists in that the areometer of Tralle indicates the percentage of volume, and Richter's by weight. The specific gravity of pure or absolute alcohol is 0·793, water being unity.

(5) J. L. C. asks: 1. How can I make a cheap and reliable rain gage or measure? A. The rain gage or pluviometer ordinarily consists of a cylindrical vessel closed at the top by a funnel-shaped lid, in which there is a small hole through which the rain falls. At the bottom of the vessel is a vertical glass tube, in which the water rises to the same hight as inside the rain gage, and is measured by a scale placed on the side of the vessel behind the tube. 2. Will a glass funnel inserted in a bottle or jar, placed in an open space, correctly indicate the amount of rain that falls? If the wind blows so that the rain falls slantingly, will it be a true criterion? A. Yes, to both questions; but not so accurate as the one just described.

(6). A. F. O. asks: 1. In the Leclanché battery, would not platinum or platinized silver be as good as the carbon plate? A. No; but copper might be used but for its greater cost. 2. What is the use of the peroxide of manganese? A. The manganese peroxide, if saturated with the solution, increases the resistance of the battery. 3. Why must the fluid extend from one half to two thirds the way up the jar and no farther? A. To aid in the oxidation of the carbon. 4. What is the light yellow efflorescence that appears around the top of the porous cup? A. It is due to impurities. 5 I keep a Leclanché element ready for occasional and irregular experiments. As it is perfectly convenient to remove the zinc when the battery is not in use, would it not be better to do so? Or is there absolutely no change or waste going on when the circuit is not closed, although the zinc is immersed in the fluid? A. The zinc rod should always be thoroughly amalgamated, in which condition it suffers no alteration whatever. 6 What are the chemical reactions of the battery? A. The carbon is oxidized by the manganese, in which state it combines with the liberated ammonia to form a carbonate. 7. It is a general truth that electrical work is proportional to the amount of zinc consumed. I have a Leclanché cell with a zinc exposure of but 5 square inches, that is doing more work than a Daniell of 50 square inches; and a similar disproportion between work and zinc seems to exist between the Leclanché and all other forms of battery. How is it accounted for? A. In batteries in which the zinc is the positive element, the work is proportioned to the zinc consumed; but in the Leclanché cell, the conditions are reversed, the carbon being positive and the zinc negative.

(7) W. H. McC. asks: How can I magnetize a compass needle? A. A steel needle may be readily magnetized by placing it in connection with one of the poles of a strong magnet for a short time. The finer the quality of steel, the stronger will be the resulting magnet

(8) A. S. G. says: In connection with answer No. 18 on p. 187 of your current volume, my experience with a small electric machine may not be uninteresting. When attending school, I made one with a homœopathic bottle, of which the rubbing surface was not quite 2 inches. The bottle was about ½ inch in diameter. The prime conductor was of wood, covered with tinfoil and insulated by a small bottle; the rubber was of silk, stuffed with cotton, not insulated. The Leyden jars were small bottles, about 1½ inches high covered with tinfoil, and filled with small pieces of lead This machine exhibited all the phenomena presented by larger ones, of course in degree proportioned to its size, but quite as distinctly. The jars gave a spark which was like the prick of a small pin, and the spark from the battery of four was too unpleasant to be often taken. I do not know that a smaller frictional machine than this has ever been made.

(9) A. O. W. asks: Is there anything that will make spelter flow easily on copper, to braze the copper easily? A. We do not know of any method other than the application of heat.

(10) G.W. asks: Why is it that the shadow of an object from the sun grows short faster in the morning than it does towards noon? A. In the morning the direction of the sun's motion is the same as the longest dimension of the object; in the meridian it is in the same direction as the smallest dimension. A pole would project its shadow as a long line in the morning, as a mere point when the sun stood directly overhead.

(11) J. W. D. says, in answer to J. H. A., who asks: What is the force of blow from a steam hammer with a 5 inch cylinder, driven by 100 lbs. pressure on the inch, working at full stroke, stroke being 1 foot and weight 300 lbs.: Velocity of a body falling 1 foot= 8·02 feet. 8·02×300=2406 lbs. force of blow without pressure. Area of 5 inch cylinder=19·635 inches. 19·635 ×100=19·365 lbs.+2406 =4369·5 lbs. This is regardless of any weight or friction of piston. [If you multiply weight and space together, the resulting product is expressed in foot pounds. The solution of the problem requires the amount of force that, acting by a quiet pressure or pull would produce the same effect as the moving weight.—EDS.]

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

F. J. W.—It is limonite. Its composition may be expressed as 2 Fe_2O_3, 3HO. It contains 59·9 per cent of iron.—T. T. R.—No. 3 is a quartz rock, lying upon a bed of dark sandstone containing scales of iron pyrites. No. 4 is iron pyrites, distributed through a gray quartz rock. No 5 is a rock containing felspar, iron pyrites, quartz and hornblende. No minerals were received marked 1 and 2.—D. H. D.—It is galena.

T. H. C. asks: When were rudders first used to vessels?—L. H. C. asks: What is the proper method of curing the leaf of the tobacco plant?—A.M. R. asks: 1. From the skins of what animals is the leather, used in the dry gas meters, made? 2. Is it made in the United States or in Europe? 3. What property in gas is it that hardens and contracts common leather?—J. M. asks; How can I make virgin platinum?—H. R. asks: 1. What pigments are used in calico printing, to make them fast or proof against water? 2. What will make water colors waterproof on paper?

COMMUNICATIONS RECEIVED.

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

On Taps and Tempering. By T. J. B.

On the South American Boxer. By T. H.

On Lunar Acceleration. By J. H.

On the Philosophy of the Steam Engine By W. M. H.

On a Small Steam Engine. By O. B. F.

On Spiritualism and Jugglery. By C. I.

On Molecular Conditions and Spectra. By J. C. D.

On the Scriptural Miracles. By ——.

On a Grain Binder. By C. H. D.

On a Negro Inventor. By. J. S. B.

Also enquiries and answers from the following:

M. M.—A. K. S.—J. H.—A. M. P.—D. G. K.—L. M. Q. —A. L. E.

HINTS TO CORRESPONDENTS.

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

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

Hundreds of enquiries analogous to the following are sent: "Who makes steel bars as substitutes for church bells? Who makes machines for making brooms, and who sells broom corn? Who sells the best earth closet? Where can soluble glass be obtained? Where are oar turning lathes made? Whose is the best book on phonography? Who publishes a book on the manufacture of flax?" All such personal enquiries 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

September 8, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,877.—RECUMBENT CHAIR.—P. J. Hardy. Nov. 25.
30,900.—VENTILATED HAT.—W. F. Warburton. Nov. 25.
30,961.—MOWING MACHINE.—J. G. Dunham. Dec. 2.
30,971.—WATER WHEEL.—N. Johnson. Dec. 2.
31,094.—FINISHING LEATHER STRAPS.—W. McK. Thornton. December 23.

EXTENSIONS GRANTED

30,038.—WINDMILL.—J. H. Babcock.
30,100.—TRANSFERRING CARS.—W. Wharton. Jr.
30,103.—HARVESTER RAKE AND REEL.—M. Young, Jr.

DESIGNS PATENTED.

7,740 to 7,743.—CARPETS.—R. Allan, Yonkers, N. Y.
7,744 to 7,746.—CARPETS.—W. De Hart, Amsterdam, N. Y.
7,747.—PEN AND PENCIL CASES.—J. U. Gerow, Brooklyn, N. Y.
7,748.—LAMP BRACKET.—F. Billingham, New York city.
7,749.—SMOKE BELL, ETC.—F. Billingham, N. Y. city.
7,750 and 7,751.—TYPE.—J. M. Conner, Greenville, N. J.
7,752.—SASH FASTENER.—F. E. Dixon, Toronto, Canada.
7,753.—TOY BUREAUS, ETC.—S. Feust, New York city.
7,754.—BIRD CAGE BRACKETS.—C. Houbel, Toledo, Ohio.

TRADE MARKS REGISTERED.

1,963.—GUNS, ETC.—Billings & Spencer Co., Hartford, Ct
1,964.—MEDICINE.—P. W. Conner, Boston, Mass.
1,965.—WASHERS, ETC.—W. Courtenay, Wilmington, Del.
1,966.—BOTTLED BEER.—Star Bottling Co., Cincinnati, O.
1,967.—CANNED SALMON.—Cutting & Co., San Francisco, Cal.
1,968 to 1,970.—BLACK SILKS.—Kiefer & Co., N. Y. city.
1,971.—SPICES, ETC.—J. Lazear & Co., Baltimore, Md.
1,972.—ROASTED COFFEE.—J. Lazear & Co., Baltimore, Md.
1,973.—LINIMENT.—C. C. Brooks *et al.*, Waverly, N. Y.
1,974 and 1,975.—COTTON THREAD.—J. Brook & Bro., Meltham, England.
1,976.—DEPILATORY.—T. Gabriel *et al.*, New York city.
1,977.—TABLE SAUCE.—C. E. Lee & Co., New York city.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA
SEPTEMBER 21, 1874.

3,813.—O. C. Hills and G. Oldham, Jr., Cuba, Allegheny county, N. Y., U.S. Improvement in curtain fixtures, called "Hill & Oldham's Cuba Curtain Fxture." Sept. 21, 1874.

3,814.—R. Adam and F. X. Desmarais, Ottawa, Carleton county, Ont. Amélioration a la maniere d'agraffer les feuilles de metal récouvrant les toitures, "L'agraffe améliorée d'Adam & Desmarais pour toiture en metal." (Improvements in the manner of making joints in sheet metal roofing.) Sept. 21, 1874.

3,815.—T. I. Browne, Inverness, Megantic county, P. Q. Improvements on railway car couplings, called "Thomas I. Browne's Railway Car Self-Couplings." Sept. 21, 1874.

3,816.—J. Conolly and E. W. Benjamin, Yarker township, Camden, Lennox, and Addington counties, Ont. Improvement in the lever and in the working of the lever on the axles of gang plows, called "Conolly & Benjamin's Improvement in the Lever and in the Working of the Lever upon the Axles of the Gang Plow." Sept. 21, 1874.

3,817.—E. E. Patric, Springfield, Clarke county, O., U. S. Reissue of extension 2,278, called "Improvement on Grain and Seed Drill." Sept. 21, 1874.

3,818.—A. O. Denio and G. G. Lobdell, Wilmington, Newcastle county, Delaware, U.S. Improvements on locomotive and other boilers and on furnaces for the same, called "Denio's Locomotive Boiler and Furnace." Sept. 21, 1874.

3,819.—I. H. Cooper, Rotherby, Leicester county, T. A. W. Clarke, A. R. Donisthorpe, and E. Corah, all of Leicester, Leicester county, England. Improvements on knitting machines, called "Cooper & Co.'s Improved Knitting Machine." Sept. 21, 1874.

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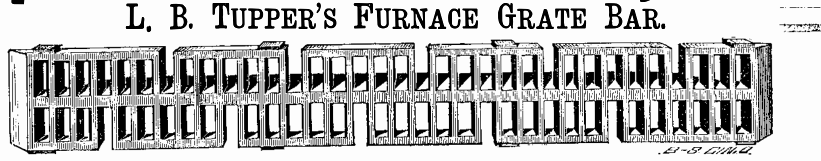

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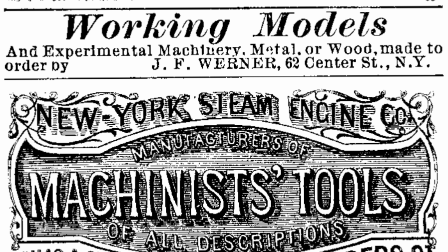

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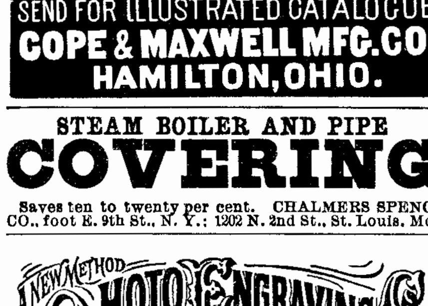

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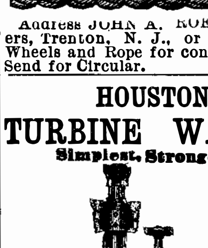

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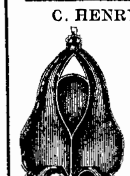

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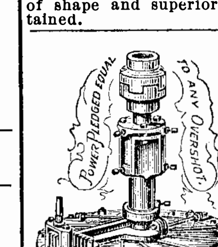

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