THE APPLICATION OF STEAM TO CANALS.---NO. 4.

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This paper would be incomplete without mention of the experiments of Fairbairn, in 1830 and 1831, as instanced in his "Remarks on Canal Navigation, illustrating the advantages of steam, as a moving power, on canals." The preliminary experiments of light single and double gig boats on the Forth and Clyde canal, moved at a high rate of speed, and variously loaded, as well as the partial success of the steamer *Cyclops*, built under the direction of Mr. Grahame, of Glasgow, with a single stern paddle-wheel, induced Mr. Fairbairn to suggest the construction of a small steamer named the *Lord Dundas*, 68 feet in length by 11 feet 6 inches in depth, provided with a wheel thorough 3 feet 10 inches wide, and a paddle 9 feet in diameter, driven by a ten horse power steam engine; but he also recommends, as an after improvement, a steamer with two narrow paddles, close to the stern, one on each side of the rudder, urging that this plan would remove every impediment to the free access of water to the paddles, and allow an open outlet for the discharge, the paddles to be protected by fenders, sliding down on the outside of the wheels.

Mr. Fairbairn figures the cost of conveyance of a passenger by steamer, between Edinburgh and Glasgow, fifty-six miles, at two pence, or less than a fifteenth of the least possible expense by horses. Though the results given by these boats were not, in practice, so satisfactory as expected, yet Mr. Fairbairn never despaired of a future when steam should be as universal in inland navigation as it at present is in all other of the arts.

Following up the interest which about this period seems to have been excited on canal behalf, we have an influx of applications of machinery to inland water propulsion, many of which are but modified forms of the less elaborate devices we have already mentioned, in which the paramount idea of their authors would seem to be that of advancing the boat without creating a wash damaging to the canal banks, and with arrangements for discharging the water directly aft, or directly down, while some have curved platforms, or "wave quellers," to moderate the swell produced by the propeling machinery.

For actuating vessels on canals, one Henry Pinkus submits a railway constructed alongside, with one rail, on which a suitable carriage traverses. A tube conveys gas along the rail from a stationary engine and reservoir. The gas is brought through a longitudinal valve on the rail tube to a flexible tube from the carriage to a reservoir on board the vessel, and from the pressure here derived machinery is set in motion, which again, by an endless band, turns two horizontal wheels (one on each side of the rail) on shore, and supported on the carriage before mentioned. Finally, these wheels, by revolving, draw the carriage forward, and the carriage, in its turn, tows the vessel. We can imagine that this plan would never depend upon its simplicity for success.

The same inventor offers the plan of a steam engine on a vessel, driving a horizontal wheel, which, by an endless band, turns on shore a pair of horizontal wheels, similar to those described, and these, by revolving, tow along the vessel. The carriage holding these wheels has a curved guard arched over it, formed like the rail on which the carriage runs. This is to enable another carriage meeting it to pass over the first, thus providing for the use of the same rail by boats traveling in opposite directions. In place of the steam engine, the machinery on board may be turned by an electromagnetic engine, actuated by electric currents from on shore. Whether this "leap-frog" arrangement for passing boats could be extended to skipping playfully over the locks is not stated.

A claim, in 1841, proposes a locomotive steam engine on the towing path, to drag itself along a chain fixed at one end, and the boat by a towing line to the engine; while another alternately expands and contracts an elastic sack in a water channel along the bottom of the vessel, by the smoke from a furnace, and thus ejects sufficient water to propel the boat. Later on, there are variations of this. Still another drives an upright shaft in a vessel, which carries a horizontal grooved wheel, on which is an endless rope, moving a drum on a carriage on shore, by which its wheels are turned, so as to advance the carriage, which tows the craft along. The carriage is guided by a wheel in front, directed by a man. Steam is made to issue from a pipe against the air in one, and cogwheels, working into a rack rail on the banks, in another, while a third places an exhausted atmospheric tube at the bottom of the canal, and moves the boat above by a traveling piston. A fourth inventor makes his tubes of wood, and places them upon the banks, or on piles driven along the canal. In fact, "about this time," as the almanacs say, the numbers that considered themselves each the sole possessor of the idea of working canals by atmospheric pressure is amusing.

In 1847, we have flexible tubes placed under water on each side of a boat. They are alternately filled with steam and allowed to collapse. The boat is supposed to advance by the action on the water of the protuberant parts of each tube. There is certainly no needless complication of details about this. In this year we find proposed the towing of canal boats by compressed air contained in portable reservoirs, and an arrangement added to heat the air, in order to restore the caloric lost by its expansion.

The next year, a patent is granted for a tube laid along a canal, and water forced through it under pressure enters nozzle pipes fixed at certain intervals along the tube. Connected to the boat to be propeled is a receiver, with a series of open cells, and as these pass under the end of a nozzle pipe, a valve is opened, which allows the water to impinge on the cells successively, and thus force on the boat and receiver, until they set the next nozzle pipe in action, and close the valve of that which is passed. Still, notwithstanding the ingenuity of this scheme, one would desire much solicitation to invest in its success. Next, we have a shaft extending the entire length of the vessel, with propellers on its projections, working one at the bow and one at the stern. The advantages of this novel feature are not mentioned.

The last of 1851, a patent for fastening iron rails upon walings, supported on piles, and extending the entire length of the canal, on both sides, was issued. Wheels on each side of the boat, and driven by a steam engine, are rotated on these rails, and pull the boat. Instead of locks, the boat moves up inclined planes, gear wheels engaging in racks on the walings, while rollers at the bottom support part of the weight. Unless compensated for all variations of water level, we might expect to find occasional lines "high and dry."

In 1856, a provisional is filed for propelling boats by discharging a stream of fire from an inflammable composition in a tube into the water at the stern; but, from want of faith, or of means, the scheme was abandoned. At a later date, John Bourne patents an arrangement of propellers at the bow, or paddle wheels at the side, to work on the bottom in shallow water, "and thus clear it away," and propel the vessel.

With their usual ingenuity and perseverance, American inventors have explored this branch of engineering practice; but, like their trans-Atlantic brethren, have taken the question of more propulsion as the desired end, attaching thereto some device to still the agitation of the water; and very similar schemes in this field to those already touched upon, have been the result of their labors. The question is not that of a motive power alone, but simple application of the motor that will prevent waves at the bow, suction and settling at the stern, and afford a mean speed of from three to four miles per hour, when fully loaded, with a minimum quantity of fuel. The propeling machinery must be simple and compact, that it may be managed by men not especially educated for the purpose, and to economize both space and expense. These are the requisites, and a boat fulfilling the conditions will be sure of success.

Some twenty-five years ago, Captain Ericsson launched a boat with a screw propeller at each side of the bow, for the Champlain canal. There was no difficulty in the propeling force, but it did not carry sufficient cargo to be profitable. Henry R. Worthington, five years later, ran a steam canal boat from New York to Oswego, during one season. This vessel had a skew paddle wheel on each side of the bow, and a fighting crew, to overcome any prejudices which the opposition boatmen should venture to express. Notwithstanding the extreme force of the arguments employed, the enterprise was abandoned with the season, there not being sufficient capacity for a paying freight.

A boat was fitted with feathering side paddles, some sixteen years ago, by John Baird, for the purpose of towing barges on the Erie canal; but, not carrying cargo itself, and depending on the tunnage fees from the old boats, failed to be a pecuniary success.

In 1860, there was a line of sharp propellers built in Buffalo, N.Y., which, with an expenditure of from three to four tuns of coal per day, averaged six and seven miles per hour. The annoyances caused by the opposition of the horse boats, and the heavy expenses of fuel and engineers, caused their removal to a lake route. Wire rope traction and submerged chains have been frequently tried as well, and found wanting, the canal locks and numerous bends having so far proved insurmountable obstacles.

As late as last year, the duck foot, or expanding propeller, so many times tried in England, was attempted in Albany, N.Y., by Mr. Cornelius T. Smith, and also at Cumberland, Ind., by Mr. Marshall, without satisfactory results; while a Cincinnati doctor, abandoning his pills, conceived that he had hit upon the correct thing by the similar device of a reciprocating hinged shutter. The result made more noise and waves for the canal than greenbacks for his pocket, and our worthy disciple of Esculapius returned to his surgery.

At Lockport, N. Y., a wheel with spokes on the surface, made so as to rise and fall in a recess in the boat, and rolling along the bottom of the canal, was lately tried. It was driven by a chain, and so propelled the vessel. No provision for deep water or soft mud being made, the enterprise came to grief. A scheme now being tried consists of a canal tug-boat provided with an endless band or chain on each side of the boat, carrying paddles, which, dipping in the water to propel the vessel, return through the air in a manner akin to similar plans which have been tried here and abandoned. There has been a large sum of money expended, and a frightful noise is produced, still, otherwise it is not considered a success.

PROFESSOR TYNDALL ON "SOUND."

In his fourth lecture on "Sound," at the Royal Institution, London, Professor Tyndall began by calling attention to the experiments of Saveur, in which musical vibrations were communicated from one body to another, when both bodies had the power of emitting the same note. The lecturer exhibited two wires of the same length and thickness, stretched to the same tension by means of screws, so that the two wires when made to vibrate by means of a violin bow, emitted the same note. He then placed a V-shaped rider of cardboard astride one of the wires, and on causing the other wire to emit a musical note, the second wire took up the vibrations and unhorsed the rider. He recommended the listeners to make similar experiments for themselves, and said that if they would sing into a piano, they would find that the wire which emitted the particular note sang by the voice, would be thrown into a state of vibration, and if a little rider were placed upon the wire, it would be violently agitated.

He next exhibited Savart's experiment, wherein a musical sound is produced by means of a descending jet of water issuing from a circular orifice in a brass plate fixed at the end of a glass tube; the sound vibrations consist of the intermittent flow of the water through the orifice. He pointed out that a jet of water issuing through a small orifice, forms a vein for a short distance from the place of exit, and then breaks into drops, caused by the rhythmic action of the water through the orifice. In his next experiment Professor Tyndall permitted a vein of water to fall vertically from an orifice; then he darkened the theatre, and illuminated the vein by means of a thin beam of light sent down through it from the electric lamp. The vein of water then looked like a luminous spear, about twelve inches long, and below this the water broke into drops, and speedily lost its luminosity. These drops could be made visible by illuminating the falling jet of water from without, by means of a series of electric flashes. The lecturer sounded a syren, and when the musical note reached a sufficiently high pitch, the luminous vein of water began to respond to the sound, and the spear shortened itself to four or five inches, resuming its original length when the sound ceased. Musical beats, produced by means of two organ pipes, caused the luminous spear to lengthen and shorten itself. The lecturer then passed from a vertical to a horizontal jet of water, and made the latter plainly visible by illuminating it with the electric light, so that its shadow was thrown upon a white screen. At a certain distance from the orifice the stream of water broke into drops as before; the syren was then sounded, and when it reached the proper pitch the drops were drawn together, and the jet of water appeared as an unbroken cylinder of liquid from end to end.

Professor Tyndall next exhibited the action of sound upon jets of air, and mentioned the exceeding delicacy required in the manipulations, in consequence of the extreme sensibility of air jets. He was obliged to protect the jet from air currents by surrounding it with a tall glass jar, and he supported the apparatus on layers of flannel to protect it from vibratory motions connected with the building, as a passing cab would otherwise have caused much disturbance. He then, by means of pressure, urged some air, from a bag, through two bottles, one of which contained ammonia, and the other hydrochloricacid; a white smoke, consisting of chloride of ammonium was thus formed, and the jet of air was made visible to the whole audience, in consequence of its being charged with smoke. The jet of smoke laden air thus formed issued into the glass jar in a long, slender stream. An organ was then sounded, and the jet shortened itself at once from about fourteen to about four inches, and at the same became curiously forked, and did not lose this form all the time the sound continued, but resumed its original shape when the sound ceased. This jet responded at once to a slight tap upon the floor.

Next, the lecturer exhibited the action of sound upon naked gas flame. This action of sound upon flame was first noticed by Professor Lecomte, and was brought to its present state of experimental perfection in the laboratory of the Royal Institution. In the first experiment the lecturer caused a straight bushy flame to spread out, by whistling to it with his mouth, and pointed out that a smaller flame of the same kind would do the same thing, but required a higher note. A fish tail flame was also shown to be sensitive to sound, but required a higher note, and greater pressure of gas; in fact, in all these experiments the pressure of the gas must be very carefully regulated, and so adjusted that each flame is very nearly, but not quite, on the point of flaring instead of burning steadily. The most sensitive burner yet obtained by Professor Tyndall is one made of stealite; it requires a very heavy pressure of gas to bring the flame to the sensitive point, and it then gives a flame two feet long. The orifice is circular, and the jet a vertical one. A slight hiss from any part of the theatre of the Institution, made this flame shorten itself to seven inches, and the jingling noise made by shaking a bunch of keys threw the flame into wild commotion. A small bell sounded thirty feet off, in the gallery of the theater, knocked down the flame by the noise of every stroke, and a chirrup always brought it to its lowest point. Speaking irritated it especially words containing many S's, for it was especially sensitive to hissing sounds. The rustling of paper, the rubbing of hands, or the brushing of clothes, all made it shorter.

Notes of high pitch acted most powerfully on the flame. When a tuning fork was gently sounded, so as to give its fundamental note, no effect was produced; but when the fork was violently rubbed with the fiddle bow, so that it gave off overtones, the flame shortened itself, and began to flare. This tuning fork was one with a fundamental note of rather a high pitch. Finally, a musical box, playing an air from the opera of "Faust," was set to work; the high notes caused the flame to fall, while those of low pitch had no influence of the same kind.

The lecture was concluded with a few experiments on resonance, and the introduction of organ pipes. The lecturer observed that when a tuning fork was held over the open mouth of a glass cylinder containing air, when the column of air was of the right length to vibrate in unison with the fork it did so, and then, as the column of air and the fork both sang or vibrated together, a great increase in the volume of the sound produced was the result. When the column of air was made too long or too short for any particular fork, by pouring a certain quantity of water into the cylinder, or taking a certain quantity out, the sound was considerably enfeebled. In one of his experiments Professor Tyndall lengthened and the column of air by admitting hydrogen gas into an inverted cylinder, and then showed some experiments with it by means of a tuning fork. He also showed that with different forks, columns of air of different lengths are required to produce perfect resonance. In further illustration of this principle, he selected three organ pipes, and by sounding tuning forks and placing them over the mouths of the pipes, he showed that the columns of air in the pipes resounded to three particular tuning forks, each column singing to its own fork and no other. Afterwards, on causing the organ pipes to sound, they were found to emit the same musical notes as the three forks, each pipe being in harmony with its own fork, and no other. The music of an organ pipe is caused by the vibration of the column of air in its interior, and this column of air is thrown into musical motion by means of a vibrating tongue set in motion by the bellows.

(From the Albany Argus.)

FOWLER'S PROPELLER.

Our citizens have been much interested during the past two or three days in the performances of a steam yacth which came here from Bridgeport, Conn. The boat has been playing about the harbor, turning round as if upon a pivot, and moving backwards or forwards with equal facility without the aid of a rudder. Recently the vessel was visited by Canal Commissioner Wright, Canal Commissioner Chapman, Deputy State Engineer Sweet, Mayor Thacher, Captain Sanford C. Van Benthuysen, and other prominent parties, all of whom expressed themselves very much pleased with the movements of the craft. The party having the boat in charge is composed of Ex-Governor Joseph R. Hawley, of Hartford, Colonel William H. Mallory, Charles R. Bement, and Jacob Kiefer, of Bridgeport. These gentlemen are of the opinion that the new principle involved in the construction of the wheel by which the boat is propelled can be successfully applied to canal navigation.

In accordance with this view, an excursion was made by way of the canal from this city to Troy. Among the invited guests were Canal Commissioner Chapman, Assistant Commissioner George L. Ames, Deputy State Engineer Sweet, Oscar L. Hascy, S. B. Towner, S. P. Corlies, C. E. Davis, B. W. Wooster, John C. Ward, G. Hunter, Robert Walker, E. Brainard, S. S. Carslake, Warren F. Leland, and several others interested in the commerce of the city. The boat is handled so readily, that there was no difficulty in approaching the locks, or passing other craft in the channel. In a clear course, she made five miles per hour without producing a swell along the banks to exceed six inches. Arriving at Troy, David M. Greene, an engineer of great experience in connection with steam navigation, was invited to examine the vessel. All the tests made were of the most satisfactory character, and it was agreed upon all hands that the experiment was a success in itself, independent of its application to canal navigation.

The invention is known as the "Fowler wheel." The ingenious inventor is Mr. Frank G. Fowler, formerly of Illinois, now of Bridgeport, Conn. Originally his device was intended for use as a windmill, and it was found to save a good percentage over any previous contrivance. It occurred to Mr. Fowler that if he profited in obtaining power from the wind, he might profitably send force through the wheel into the water. He had the fortune, less common now than of old, to be unable for a long time to find appreciative listeners and co-operators. He made one or two experiments upon canal boats, but his wheel was then in a comparatively crude condition. In Connecticut he met Colonel William H. Mallory, of Bridgeport, a gentleman who had been a successful inventor himself. The Colonel and Mr. Fowler have been working together for two or three years. The wheel has been materially improved and fully secured by patents in this country and abroad.

A yacht called the "Pioneer" (the one now in Albany) was built two years ago expressly for this purpose. She is seventy feet long, fourteen feet wide, and schooner rigged. Without her masts and unloaded, she draws four feet. It is not pretended that she is built for speed, for it was intended, if the new wheel did not prove valuable, to convert her into an ordinary tug, with an Ericsson screw. The boiler is an ordinary tubular horizontal, with return flues. The engine has one cylinder only, fourteen inches square; that is, the cylinder is fourteen inches in diameter, and the piston has a stroke of fourteen inches. An experimental condenser now in the boat has temporarily reduced the power of the boiler, and it is difficult to raise more than thirty or forty pounds of steam; and with only one fourteen inch square cylinder, no great speed can be obtained from any wheel whatever. But when the boiler carried seventy or eighty pounds, the boat made at the rate of eleven miles an hour on a mile measured by the Coast Survey, which will do very well for a boat of seventy feet.

Let us attempt to convey an idea of the invention, if it can be done without a drawing. The stern of the boat is cut away underneath about as much as for the ordinary screw. The latter has a screw nearly horizontal. The shaft of the Fowler wheel is perpendicular in the stern, and the wheel works on a horizontal plane. This one has three arms, each with its adjustable blade. Experiments were made with four and two, but three were found to be the most economical. The wheel is four and a half feet in diameter. The extremity of each arm is inserted, by a movable joint, in the center of a thin strong steel blade standing perpendicularly. The blades are twenty-eight inches in depth, twelve inches at the top and ten at the bottom, and slightly rounded at the counters. The blades stand with their sides toward the center shaft. Above the arms there is an eccentric on the shaft, which is held fast as the wheel revolves. From the ring or strap around the eccentric, strong rods extend to the outer edges of the blades. Now as the shaft revolves, the blades, as they pass around the circle, change their set, so to speak; that is, the edge of a blade to which the eccentric rod is attached moves from and toward the shaft. As a blade moves forward, it acts upon the water much as a man's hand does when he is swimming. It may be said to hook or pull upon the water, and pull the boat forward. As the blade goes to the rear, its angle upon the arm or radius is changed, and in passing around the rear of the shaft, the blade drives the water to the rear, pushing the boat forward. In the revolution there are two points at which the blade is parallel with the keel and exerts no power.

We have described the boat as moving straight forward upon the line of her keel. The eccentric is governed by a wheel on deck, just like the ordinary steering wheel. If it be desired to change the course of the vessel, the eccentric is shifted. This shifts the set of the blades, and the line of force exerted is put at any desired angle with the keel. In an instant, with a whirl of the wheel, the power is exerted at right angles with the keel, and the boat whirls around. Or without a word or signal to the engineer, the power is completely reversed and the wheel is pulling straight astern. In a few seconds the boat is going astern.

There is no reversing gear on the engine.

The power can be exerted in any direction, that is, at any angle with the keel, with an easy turn of the wheel, which two fingers can govern.

There is no rudder on the boat; the steering is done by shifting the direction of the power.

The Ericsson screw works in a plane vertical to and at right angles with the keel. The Fowler wheel works in a horizontal plane. The latter can adjust the breadth and depth of its blades so as to exert the same power with half the draft. It can place the blades below the ice, and at the same time farther from the bottom than the screw works.

The proprietors claim greater economy in construction, unequaled facility of turning, less draft than the Ericsson with the same power, and equal if not greater speed.

They are making several applications of the wheel, and they are very hopeful that they have the invention which is to settle the future of the Erie canal. The simplicity of the engine, quickness of turning, and light draft, with great power, are adapted to this end.

In Buffalo, at the shipyard of David Bell, two revenue cutters are building, for the revenue service. They are of 250 tons burden and of the same model, as nearly as possible. One is to have the Ericsson screw, and the other the Fowler wheel. They will be completed before the first of August, and they are to be taken down the St. Lawrence and delivered in New York. The test will be exceedingly interesting.

The Fowler steering propeller company have two tugs building at Philadelphia, 73 by 16, with each an 18 in. square cylinder. Also a small vessel in Maine designed for seine fishing for menhaden or "bony fish." The navy department has in preparation plans for two monitors of peculiar construction, with this wheel, which has, for fighting, wonderful advantages over any other. The company has also built a steel launch, 33 by 8, on the precise model of the largest launch of the navy, and, they claim, to have made with it speed greater than that of any steam launch in this or any other navy.

Animal Mechanics.

Rev. Samuel Houghton, M. D., Dublin, D. C. L., Oxon, F. R. S., recently gave the first of three lectures at the Royal Institution, on "The Principle of Least Action in Nature, illustrated by Animal Mechanics."

Dr. Houghton said that he would give a few examples to show what he meant by "The Principle of Least Action in Nature." If we suppose the earth to be a lazy, intelligent, living animal, swimming round the sun, we only require to know three points to mathematically calculate its whole orbit, on the assumption that it is a living animal swimming round the sun in such a way as to get through its journey with the least trouble to itself. On the same principle. his hypothesis was that in every arrangment of joints, muscles, bones, and parts, the arrangement must be such that the muscle will occupy exactly the position it would take if it were a living intelligent animal, which had sought the place where it could do its work with the least trouble to itself. By means of the hypothosis it is possible to calculate the position of the bones, sockets, and muscles, and it is one which he believed would prove to be a valuable key to unlock the secrets of animal mechanics.

He would give another illustration. One day he watched some oyster women in the Mumbles harbor, near Swansea. They filled their baskets with oysters, and then the ground they had to traverse consisted of two parts. The first part consisted of slippery shingle, and the second of plain common.

What surprised him was that they did not walk straight to the common as he would have done, but went off in a slanting direction, and made a "tack." After seeing this he measured the angles made by their path, and by the one he would have taken; then he mathematically determined the relative roughness of the two roads, and found they had chosen the best they could possibly take to save unnecessary waste of power. He did not suppose they had any more consciousness that they were doing so than a planet or a ray of light; they were not, however, lazy animals, but good industrious women, doing the maximum of work with the minimum of effort, their path being determined by Him who made them.

As another illustration he would call attention to the hexagonal cells made by the bee, whereby the largest quantity of cell space is made with the minimum amount of wax. Nature, or the intelligence which underlies nature, has to produce a certain amount of muscle to do a certain amount of work. so it is obviously to the interest of the creatures, formed by nature, to do their work with the least possible quantity of muscle.

Before it is possible to advance one step in the scientific investigation of animal mechanics, it is necessary to ascertain the coefficient of muscular force. In the case of a rope, its coefficient would be the number of pounds weight necessary to break it across. Suppose a rope, 1in. square in cross section, made of muscular fibre, were hanging from the roof of the theater of the Institution, what weight would it lift from the ground by its contraction? That weight would be its coefficient. It cost him twelve years of hard work to determine this point, and to obtain the following figures for human muscle:

Arm....................	94·7	pounds to the square inch.
Leg......................	110·4	" " "
Abdomen....	107·0	" " "
	104·03	pounds, the real coefficient of muscular force.

Until the foregoing coefficient was obtained he could take no steps in the application of geometry to anatomy. He was obliged to make his experiments with human beings only, because none of the hairy animals with long tails had intelligence enough to aid him by doing what he required of them. As regards men, he had to measure the power of their muscles during life and the size of their muscles after death. In walking across the room a vast number of muscles are brought into play, so the difficulty is to ascertain the power of each particular muscle; and from such movements the inquirer cannot work back to know the force per unit of cross section of each muscle.

By work in hospitals, where some of the patients suffered from diseases in which muscular contractions were a leading feature, he gained some of his data, and in other directions he sought for more. He learned how to work the treadmill so as to get through the task with the least trouble to him self, and he could now do it in a lazy manner as well as the cleverest burglar in London. He also knew the easiest part of the wheel to work at. The key by which he first obtained a clue to these secrets was an ounce of tobacco, which key he found competent to unlock the heart of the surliest of burglars.

He not only had to determine the power of the muscles of young healthy men during life, but to measure their dimensions after death. Many of his examinations after death were necessarily made upon elderly persons, wasted by long sickness, and this tended to give false results. Therefore he, to get accurate results, had to watch for chances of examining subjects who died suddenly by violent deaths, or who were executed by the hands of the law, but in Ireland he found many impediments to this line of action. In the case of violent deaths by accident, the cause of death was usually so obvious that the coroner could not order an examination of the remains, and the friends of the deceased were usually so anxious to "wake" him that they would not permit scientific dissection of the body. Then as to those who suffered by the hands of the law, in Ireland murders of a social or private nature incurring the penalty of death are almost unknown, and men are usually only executed for agrarian crimes; in such cases the criminal has with him the sympathy of such large masses of people that it would be very dangerous for a scientific man to dissect the body of any patriot who had shot his landlord. While beset with these difficulties a clever but rather wild scheme entered his head, of taking a farm in Westmeath, refusing to pay his rent, shooting his landlord, and then dissecting the body at his leisure. But he saw that certain inconveniences might attend this plan; in short, he believed, upon his honor, that public opinion in Ireland would not tolerate the shooting of a landlord in order to obtain the coefficient of muscular force.

However, he had at last succeeded in obtaining the coefficient; and the use which could be made of it, he would explain in his next lecture.

Guillois' Dental Cement.

Professor Charles James Fox, in the *British Journal of Dental Science* says:

It is of the same nature as that commonly called osteoplastic, but it differs from it in this particular, that it can be mixed to a consistence much resembling putty, and in that state can be manipulated for some minutes without setting irretrievably. If you mix the other osteoplastics as thick as this, they set rapidly or crumble; if you use them in a thinner condition, they run about on the gums and teeth. When once set it is so hard, if it has been properly manipulated, as to turn the edge of the instrument, should it be deemed requisite to remove it. As to its durability, it is of course impossible to say much, seeing that it has only been introduced into England for a few months; but this much may be said, that, taking four months' experience with other cements, and four months, with this, I have found it so superior that I have entirely discarded all other osteoplastics, amalgams, etc. In small cavities in the incisors, or in shallow cavities where osteoplastics would wash out in a short time and dissolve away, Guillois' cement remains at the end of four months as good as when it was put in. I cannot tell what further experience may prove, but so far—and only for four months' experience do I speak—I have not had one failure, which is more than I can say of any other."

This cement has also been successfully used in this country for some time past. A writer in *Dental Cosmos* says that it is susceptible of a polish, and that it can be colored to imitate the natural teeth, so that a filling composed of it can hardly be detected. It is believed to be a good substitute, in very many cases, for gold fillings.