This produces a tulip-shaped flame, and it has a specially constructed glass arrangement on the outside for regulating the combustion. Comparing the above-mentioned burners with each other, we arrive at the following results: The "Lillois" burner consumes 70 liters of gas per carcel; the Siemens ordinary, 70 liters; the Siemens-Breitmayer, 35 to 39 liters; the Wenham, about 35 liters. Taking this into account, and considering that a carcel corresponds with 105 liters of gas consumed in the Bengel form of burner, we see that the economy in gas might, by employing these burners, reach from 33 to 71 per cent. If this is compared with the batwing burner, which produces the light of 1 carcel with a consumption of 120 liters of gas, the economy is greater—varying, according to the type of lamp, from 41 to 85 per cent.

SYNCHRONIZING CLOCKS.

At the recent meeting of the Institution of Mechanical Engineers, Dublin, Mr. Davey, of Leeds, spoke of synchronizing mechanisms. He had occupied some of his spare time in attempting to synchronize clocks from a standard clock. The problem is similar to the

DAVEY'S PENDULUM FOR SYNCHRONIZING CLOCKS.

W, friction wheel attached to pendulum. L gives no impulse except when the electro-magnet is excited. K, lever and weight lifted by electro-magnet. E, A, open contact completed by pendulum each swing. B, battery. R, ratchet wheel and pawl. M, lever fixed at top. L, weight at end of bell crank lever, which drives pendulum once each minute, being raised by the electro-magnets.

present one, except that it is rough-and-ready, compared to the present one. He had a novel electrical pendulum, to drive a seconds pendulum by electricity. Electrical clocks are notoriously bad timekeepers; on account of variation in the strength of the electrical current, the battery falls off. He had constructed an electric clock having a seconds pendulum, and recording an impulse once a minute. On the pendulum he had a little ratchet wheel, R, having thirty teeth. The pawl was connected with a lever, M, fixed at the top. On the face of the wheel a little pin rotates with the wheel. On the side of the clock case was a contact maker, which closed the circuit by the pin on the ratchet wheel, R, once every minute. The weight was lifted by the electric current, and by its fall gave an impulse to the pendulum. The pendulum was a free swinging pendulum for 59 sec., and the increase of the arc could scarcely be detected.

COAL TAR AS FUEL FOR STEAM BOILERS.

By JOHN M'CRAE, of Dundee.

ABOUT three years ago, when the sudden and serious fall took place in the value of the secondary products produced in gas works, many gas managers—ever desirous of doing their very best for their employers—were forced to look around for some better market in which to dispose of the products which had so seriously fallen in value. This was no easy task; and even now it forms very uphill work indeed. A comparatively new market has been created for the disposal of boiled tar at several of the German ports. But the expense and difficulty of loading ships with tar in casks take very much from the saving derived from the new manner of disposal. It occurred to me, therefore, that we must look nearer home for a remedy.

In all gas works of any magnitude, a considerable quantity of fuel must be employed for the purpose of supplying the works with steam for the exhausters engines, chemical apparatus, thawing purposes, etc. Whether this fuel consists of coke or of coal, will not in the least affect or alter my figures. I have no doubt if any manager discovers that he is working more economically by selling the coke and using a cheap small or other coal, he will adopt the cheapest process. In Dundee, where we get a good price for coke, I found, for the purpose of steam fuel, it would be far cheaper to buy small coal costing from 5s. to 5s. 6d. per ton delivered in the works, and dispose of the coke. The question of fuel then lay between coal and tar; and I have experimented somewhat extensively to ascertain the true relative values of the two classes of fuel. For the purpose of this paper, and within the last few days,

I made a further examination into the question; and the results arrived at will be those here quoted. The coal we employed was what is known as Stravenhouse small coal, which costs 5s. per ton delivered. The experiment in each case lasted 48 hours. The tar employed was what is known as boiled tar; the naphtha having been previously removed, but the pitch oil left in the tar. The value of this tar in Dundee is about 4s. per ton. The following are the figures:

Coal, 10 tons 16 cwt., at 5s.....	£2 14 0
Tar, 1,460 gallons (or 9 tons 3 cwt. 160 gallons = 1 ton), at 4s	1 16 7

Saving per day by using tar..... £0 17 5

And this at the longest day, when we are using a mere fraction of steam, as compared with our winter requirements, and consequently the profit is proportionally less than it will be when we are in full work.

And now allow me to direct your attention for a short time to the appliance made use of in accomplishing this tar burning. On the wall is shown a diagram giving in detail the injector known as C. & W. Walker's patent tar sprayer burner; and it is supplied only by that firm. The tar, which has been brought forward to the boilers in a thoroughly liquid state, is discharged from the center of the injector into the furnace of the boiler. Surrounding the center nozzle of the injector is an annular space through which high

pressure steam passes, also into the furnace. The meaning of this steam moving along with the tar is to force a draught, as well as to raise the temperature of the tar, and so partially convert the tar into vapor; thereby making the combustion more complete. The flow of the tar is regulated by the very delicate sluices attached to the injectors. These valves consist of elongated cones and plugs, and are constructed not only for the purpose of regulating the flow of tar, but also for removing any obstruction or incrustation which may accumulate in the nozzle. In order to keep the tar in a liquid state (which in the winter time is not an easy matter), a small steam pipe is passed through the center of the tar pipe; but, of course, no steam is discharged among the tar, as the presence of water in the injector prevents its correct working. The steam pipe is simply passed through the tar pipe, and a steam trap attached to its end. In changing from the coal or coke fuel to the tar, little or no difficulty is experienced, and very rarely is a shovelful of any kind of solid material required. The furnace bars have only to be kept covered to prevent the waste of tar and the too rapid ingress of air; and when the furnaces are in full work, and being well and carefully attended to, the tar will be found to have been nearly all consumed before reaching the solid material covering the bars. The action is very much the same as in the paraffin oil lamp. The wick is the medium by which the oil is brought to the point of combustion, where it is developed into light; but the wick remains little injured, although in close proximity to such intense heat. The oil burns, not the wick. In the tar furnace, the tar itself burns, and the tar only.

It will be easily understood that a little experience is necessary to enable the attendant to fully understand the quantity of tar by which complete combustion is to be obtained, and which in no case must be exceeded. The moment one atom of tar is sent into the furnace beyond that which can be thoroughly consumed, you have then the most hideous discharge of black smoke (carbon) which it is difficult to describe, but which can be easily understood, and, I believe, can be seen within a few miles of where we now sit. I should mention that the injectors are fitted on the furnace doors; but the connections are of such a nature that the doors can be opened without disturbing any of the permanent fittings.

And now I have told you that the results detailed in this short paper were those obtained in the Dundee gas works. This is so; but were I to leave the matter here, it might be inferred that I considered similar results might be obtained in any and every gas works. I would not mislead you; and therefore must detain you for a few moments longer in order to show you how my town is different from many others. Dundee is very peculiarly situated in this respect. It is a long distance from any tar distiller's works capable of dealing with the large quantity of tar we have for sale during the winter. A large portion of the value of our tar must, therefore, go to the railway company, to cover the cost of transit between the two points, and so the tar distiller can allow us but a small figure for it at the starting point. Then again, Dundee being

far distant from the coal fields, the coal is exceptionally high in price. I quite believe that in many of the west country towns the coal for which we are paying 5s. per ton could be had for 3s.; and the tar for which we are receiving 4s. per ton, they would get not much under the double of this. Therefore, you see, in a place so circumstanced, the figures I have given would be most misleading. Still, I doubt not there are places as badly situated as Dundee; and it is to such places that my remarks are directed. I believe also that, in many towns distant from collieries, the tar might be sold to manufacturers for use in their steam boilers; and such an arrangement would, I think, prove advantageous both to the seller and the user of this liquid fuel.

I think that as much has been said in regard to my subject as is necessary; but permit me to add that I believe there is a future for liquid fuels. I do not say tar, but more concentrated fuels, such as crude naphthas, paraffins, and pitch oil. When you see one of our large steamers taking coal into her bunker, it must have appeared to you that there was great waste of power here. Every ton of coal laid in must require a certain amount of power to carry it; and every ton of coal so laid in reduces the cargo-carrying power to this extent. A few gallons of oil will give you the steam-producing power of a ton of coal; and this is a fact which the owners of non-paying steamships should note. Take our locomotives also. Everything I have said in regard to steamships applies to them; and the comfort to the stokers and the general reduction in labor would be very marked indeed. Of course, it may be argued that if there were such a large demand created for oils for furnaces, the old fashioned law of supply and demand might come into play, and so force up the price of the article for which the increased demand had taken place. But I think this state of matters is rather remote, when we bear in mind the great oil wells only now becoming developed, and the oils from which can be run in bulk direct from the wells into ships, and brought to this country at very low rates.—*Journal of Gas Lighting.*

WATCH CLEANING AND REPAIRING.

By "OLD FOGY."

BEFORE proceeding with what I consider the best methods in this department of the watch and jewelry business, I will say that I do not, by any means, consider that my way is the best, for although I have been in the business quite a while, yet I find that I learn something new almost every day that I live, and expect to do so, so long as I continue in the business. Be very particular in selecting your tools; about three widths of screwdrivers, and keep them in the best of order, square across the point of blade, and never use a screwdriver too narrow nor too wide for the screw, and in using be careful not to let it slip, and thus mar the plates or bridges of a watch. I also recommend that the handles of these screwdrivers be of different shapes or styles, so as to save time in picking up the one you want (and just here I will say that every device or method that saves time will be of great value to the operator); then have about the same number of tweezers (3), one of good, solid, heavy points, say $\frac{1}{16}$ inch wide at the points, for taking down a watch, and handling the heavier parts, and then one a little finer, and one very fine to work in about the train, hair-spring, etc., and always keep these tweezers in perfect order at the points, so that whatever you handle, you will not mar or drop the things you are handling. Right in this connection I will say that I cannot find tweezers that suit me. So I make my own, and you can do the same if you will by selecting some nice steel. Then a good assortment of pliers, cutting, flat, and round. In selecting brushes, you will have to be very particular and secure the open and straight bristle brushes, which are also hard to find these latter years. Take all the coarser brushes and hold them on a coarse grindstone, running them whole length, both ways; this takes off the new rough end of the bristles before using first time. Then there are punches, broaches, drills, calipers, countersinks, files, etc., etc. Besides this, I have adopted the plan of making any tool I happen to need for any special purpose, so that by making these at the time I happen to want a tool that I cannot purchase, I have accumulated quite a variety of odd tools; among them are a varied lot of millers, for milling and raising jewels, and deepening the countersink holes for jewel settings and screw heads, also a tool for holding a roller, to set the jewel pin, and one for holding the hair spring collet, and a pair of tweezers for holding jewels while cleaning, etc., etc. As to lathes, I have found that there is a necessity of about two lathes; one a Swiss, light running lathe for cementing any pivot work, and I prefer these because they run much lighter and easier than those heavier American lathes; and yet if confined to but one lathe, I would use a small sized American lathe, with a good assortment of split chucks, particularly those with the smaller sized holes, for holding balance staffs, wheel arbors, etc., which come in use almost every day, for taking off the burr from the point of a balance pivot, which has come from a collapse of the case; driving the end stones down on the end of pivots, even sometimes to the extent of heading them over inside of the hole jewel. These small size split chucks I have found extremely useful for the last named purpose, and I am not so "sentimental" but that I oftener use these split chucks, even for setting fine balance pivots, rather than take time to cement them; and while I do not advise the use of a split chuck for this purpose in every case, yet with a little experience one can tell when a staff is held so that the new pivot when set will "line" and be true, and of a clear beat or swing. To make a very nice pivot the cementing process is preferable, and yet, for nearly a year, my old No. 1 American lathe was not set up (for reasons I need not take space to explain), and during that time I employed a very skillful workman to do my pivoting, and this man would not think of ever doing a nice job unless he cemented it, and I can assure you that he put in more pivots out of line, and out of true, in the course of those few months, than I had done badly in my life. Speaking of "sentiment," I will say that too many young workmen use the lathe too much, and seem to depend on a fine-looking lathe and handsome tools, and spend too much time in using the lathe and in decorating their bench with a fine display. But don't construe this as meaning that one can

do nice work with a jack knife and handsaw, for I most certainly believe in a good and substantial set of tools, or I would not have taken so much space in speaking of them. Next, one must have a good bench, wide and of good length: and if no other drawers, a shallow depth drawer, exactly in center of the bench, with no knob in front, but rather a lip running its whole length, underneath. So that wherever you place your hand you can pull it out. This drawer I would have large and roomy (wide and long and extending back as far as the depth of the bench will allow, but shallow, not deep down in), and then partition it off by narrow slats, diagonally across it, running these slats from the extreme near right hand corner to the further and extreme left hand corner, so that as you reach your right hand in to take out a tool, you can grasp it naturally without twisting or cramping your hand. About eight inches below the top of the bench, I would place a skin drawer (the name comes from the practice at watch factories, formerly using sheepskins for the bottoms), which is made with a square frame (say like a picture frame), sliding on slats or a groove, so that it can be drawn out toward the operator, and when so drawn, the elbows will rest on this frame, with the wrists resting on the edge of the top of the bench, thus giving a firm support for both arms and hands, and this frame having stretched across its bottom a skin or canvas, will catch and retain anything that drops or rolls from the bench. This latter drawer I consider almost an indispensable article to doing good and successful work. At the right hand of these two drawers named, running down to floor if need be, there can be a series of drawers for tools and materials. Now with these equipments, and some others, not herein named, such as vise, file block, bench stake or anvil, and a large variety of such tools as will accumulate, I am ready to give you my ideas regarding the cleaning and repairing of watches. First and foremost, do not undertake any job that you have any or considerable doubt but what you can do successfully, and never leave a job worse than you found it; and never mar, cut, or slash any part of a watch. In other words, don't undertake a job that you have doubts as to whether you can do it correctly. One of my old masters told me never to undertake to improve on the maker's work, and this, while not true in every case (particularly cheap watches), yet is a safe rule to go by. Never allow your file, screwdriver, pliers, tweezers, or any tool to deface any part of a watch. I shall speak of this as I proceed. First, be careful and not let the movement swing so as to in any way injure the balance, in taking from case, and if a lever watch, take out the balance the first thing after getting out of case. Now see that the mainspring is let down and then remove the screws from the plates, taking care not to damage or bend any of the pivots as you do this. When all in pieces, before you proceed to clean, examine with a strong glass to see if the rim of any wheel is rubbing or clashing with anything, particularly the center wheel in any full plate American watch, for these wheels are often dragging on the plate or striking the ratch wheel because it is not true, and if examined before cleaning the places where it drags, are a tell-tale of the mischief. Also make any diagnosis of the watch that is needed to discover any errors from wear or accident, and correct them before going further, such as looking to each jewel, pivot, and other parts, and make all necessary repairs before cleaning. I have been in the habit for several years of putting my balance wheel separate from all connections, and trying its freedom in all positions, and if you will try this method, you will be surprised how many you will find that bind or are not perfectly free in all positions, when you give them the very slightest impulse by a twirl of the hand, holding the plate. Then, too, a careful examination of each jewel; you will be surprised how many are either loose in the setting or plate. In regard to cleaning, I use the old method (after trying all ways suggested)—that of chalk (but I use the old lump chalk, for those carpenters' chalk balls are made with some kind of paste that adheres to the plate)—and have this lump of chalk at my right hand, in a perforated bottom box, so that any coarse pieces fall through to the floor, and by rubbing the brush across it and then giving it a slight rap, before applying it to plate, any hard or heavy substance will fall out, and then with light pressure with the brush that is medium soft (and prepared on grindstone as before mentioned, if a new one) brush the plates, with an occasional breathing on the surface, clean the old oil or tarnish, and then peg out each hole many times, until you are sure every hole is clean, by pegging both sides, and then with a soft dust brush dust thoroughly by striking the brush into the holes on both sides. Of course, remove all end stones, and clean out with soft pith, holding the jewels in a pair of hook nose tweezers, mentioned. Should the plates and wheels be very much soiled and oily, a covered dish of alcohol is indispensable, and I have had a glass stopper bottle, with ether, in which to dip the jewels, pallets, and other small pieces, which takes the oil all off, but be sure and clean off with soft pith or pegwood such pieces as you have thus dipped. This ether will carry all loose lint or other things to its bottom, from hairsprings or roller table, and if held but a moment will do effective work, and not loosen shellac.

Regarding loose jewels, I am not so sentimental as to refuse using some shellac, if the burnished lip has been so thin as to be partially gone, thus loosening the jewel to hold in the jewel, by taking small and minute particles, and placing around the edge of the jewel, and then holding the plate or bridge over an alcohol flame, and allowing the shellac to flow around the jewel and fasten it firm, and by this process I have kept jewels firm in place for years, with no other attention than the first, and as a rule this can be done and not show. When you have thoroughly cleaned the different parts, holding everything with soft tissue paper, then with the paper put the watch together, never forcing any part into place, and when screwed or pinned together, try every wheel to see that there is the proper end and side shake to each pivot, then introduce the balance wheel, having been once tried alone as described, and see that the banking pins are so adjusted that the guard pin on the fork (lever) does not drag on either side, and that the jewel pin enters the slot, clearing the opposite corner, and that the guard pin is so in position that it will not allow the pin to pass by at any point and bring the jewel pin outside the lever, or so it will strike in hollow, or on the corners of the hollow of the roller. When you have oiled each pivot exactly on

its connecting point of bearing with just the right amount of oil (of course, oil those jewels having end stones before putting watch together), your watch is ready for the dial, and in replacing the hands you cannot be too particular about their being free and clearing each other and the dial and glass. There is the care of the mainspring I have intentionally reserved till the last. There are lots of theories why a spring will break just after cleaning, but I only know that since I have adopted the method of never taking out the spring (except when, after taking off the cap of barrel, I find it is all gummed up with bad oil, and then of course clean it) I have found that a spring does not break any oftener than is common, even if the watch is not cleaned; but I invariably remove the barrel arbor and clean out the holes and the arbor itself.

Of course to explain every detail of the method of repairing the various parts of a watch would take more space than you would allow in your journal, and hence I will not attempt to go into minute detail, except perhaps some of the more important items, and the most common things found in every day experience. Among these are broken pivots, worn pivots (sometimes requiring new ones), worn holes in plates, and at the intersection of barrel arbor, ratch and bridge of Swiss watches, etc., which, as a rule, require common sense as much as practice, and it varies in different watches, so that the common sense rule applies the best to nearly all of these, and if you have not got common mechanical sense, then you have mistaken your calling and should do something else. In any of these repairs don't go it blind, but study your case carefully and do the best thing you study out. When there is a worn pivot hole in a plate, and one side is countersunk for oil, then have a punch rounded at the point, just the shape of the countersink (and if you have not one make one, and here is where my rule, that of making a tool as the need comes for it, comes in play), and by screwing this punch into the vise, and with a smooth, flat point punch (slightly cornered of course) in one hand and holding the plate or bridge with the other, with the countersink on the punch, have a striker tap light and quick blows, and you move the punch around on the side most worn (and one side is almost invariably worn most, throwing the wheel arbor out of upright) and close up, even a little too much, and then with a round, smooth broach enlarge it, so that it will be right size, and this leaves it hard and smooth.

Broken pivots, as I have hinted, I place the arbor in a split chuck, and if true, I drill into the staff with a drill, made from a nice piece of steel wire, the old and ordinary shape of a drill, which is a trifle larger at the cutting point than it is back of the point, and I make these as I need them, and harden simply by holding the wire in a flame till red hot, and then dash into an apple, potato, soap, or pure rubber. Which is the best of these I have as yet been unable to determine, so I use either as the most handy. Take a good, tough and small pointed graver and turn a slight center in the end of arbor I am to drill, and then by giving my lathe a back and forward motion, I begin to drill, and by the sense of feeling I can tell whether my drill is cutting or not, and if not, I have a small, smooth oilstone at hand and sharpen the drill as often as it refuses to cut, and if that drill will not cut, I make another.

I make my drills of very small wire, filing them at point and then tap the point (holding the wire in a very fine pin vise), thus flattening as well as spreading it, and then shape the cutting edges as spoken of above. When you have drilled sufficiently to hold a plug firmly, then have a piece of steel of spring temper filed so as to fit closely and so straight that it will not act too wedging (and split the arbor), drive it in, cut it off and turn down, finishing with an oilstone slip, and polish by running the lathe rapidly and with a piece of thin boxwood (or hard pegwood) charged with diamondine, being sure that the end of the pivot has no burr, thrown either way, over end or on side, for such a burr will cause a lack of freedom of a balance pivot particularly. This matter of setting pivots requires a longer experience than almost any other work, and it needs a long practice to do a nice job. If your split chuck will not hold your staff or arbor true, then use cement; but in this, too, you must be sure that your center is true, and that the sound pivot enters it perfectly. Sometimes you meet with steel so hard that you cannot touch it with a drill, in which case draw the temper of the staff or arbor you are drilling, and if it projects so little that you cannot draw the temper without injury to the wheel, then unstack or separate the wheel, and by drilling a hole into a piece of brass wire, about the size of the staff you are drilling, insert the staff in this hole, and then heat the wire near the staff and thus gradually and yet effectively draw the temper.

I consider it well for young workmen to practice pivot setting in some old and useless watch any spare time they may have, and thus become adepts at this work. Unhindered, I am not over on an average of one-half hour in setting any ordinary pivot, especially if I do not have to cement my work. If this is a balance pivot, be very careful to see that your balance is true and poised before putting on hair spring and roller. There are some pivots that are underturned (to make look tidy and light), and sometimes it is about an impossibility to put in a new one, and in this case, if an American watch, I always put in an entire new staff, and hence keep a full assortment on hand.

Regarding replacing broken jewels, I also keep a full stock of these, turned (the setting) to match any make or style of watch; except, of course, Swiss watches, and for these I keep a large assortment of sizes, both of cock and foot and wheel jewels, and a full stock once procured, they last a long time and are a good investment, for with them you can meet any emergency.

In a Swiss watch, or any watch where the jewel is set into the plate, have some one of the devices for throwing up the burnished lip, and then select a jewel that just fills the space, and then with a smooth pointed punch, such as I described I used for closing up a pivot hole, I turn this lip back by sliding this round pointed punch around the outside, making it act as a burnish. Cap jewels I either treat in the same manner as the last, or cut away the setting, and insert them as they are inserted in most Swiss watches.

I have now taken up the more common repairs, and will close by hastily speaking of the more rare cases, and the adjustment of the hair spring, etc., etc. It is often the case that there is never end shake to the balance to make it absolutely safe when screwed into the

case, and when this happens I take the point of a sharp graver and prick up a burr on the bridge, and never on the plate, as any unskilled workman does, for the underside of the bridge never being finished, you really mar nothing, and sometimes this raising of the cock (or bridge) becomes a necessity, to have it clear the rim of the balance, which, if raised, it will clear, and then by bending down the end of the cock at point where the jewel is, and thus regulate the end shake. I hardly know how to give directions how to proceed in adjusting hair springs, when they are disarranged, but if I could see you, I could explain by example what I cannot well do in words. To commence, a hairspring, when there is no power applied to balance from the jewel pin, should be, when pinned, just as free from any twist or cramping as it would be if lying flat and free on a smooth piece of glass, before it has been pinned at either end, and when it is pinned in the watch (at stud and collet) it should be thus free. To bring it thus requires demonstration that cannot be made on paper, unless you could make diagrams, too numerous for this article.

What I have said regarding it, however, gives an idea of how a hair spring should be pinned. Common sense is demanded here as elsewhere. To put a watch in beat, too, is a very important item, which I do by placing sharp pointed tweezers, first on one side of the arm of balance and then on the other, and so pin my hair spring in the stud, that it will let off as readily on one side as the other. I had forgotten to say that every watch should have a little oil on the face of the pallet stones. I know full well that some workmen will say that there should be none, but I can tell of scores of watches that have failed and indeed stopped simply for want of oil on the pallets. Selecting mainsprings, too, needs much more care than is usually given to this department, and as a rule even the watch factories fill the barrel too full, that is, too long springs. Whether I am correct in this or not, you cannot be too particular in selecting the right strength, length, and width of mainsprings. Mainsprings should be well and carefully oiled.

There are many ways of replacing broken teeth in wheels, and the width of the web and the size of the teeth has much to do with how they are put in, but I usually dovetail them in, and then with the very tiniest bit of soft solder fasten them, but in so doing be positive you have got off all soldering fluid, that it will not rust the pinion into which it meshes, and be very particular to have it exactly like the rest of the teeth in same wheel, and don't mar the web of the wheel more than is possible.

I will now draw this article to a close, well appreciating the fact that I have only made a superficial attempt to instruct younger men in the cleaning and repairing of watches, for there is almost an endless variety of special repairs coming almost unexpectedly to any one, even if they have been in the business a long time, as I have, and as I first said, I am learning daily some new phase of the business, and am surprised that I never had known it before. I have, too, taken perhaps more space than I ought, regarding tools and bench, yet the older I grow, the more I can see the importance of this part, that I may be enabled to do work well and quick. Besides, I have left such repairs as the chain and fusee, uprighting wheels, repairing cases, adjustment to position, heat and cold, isochronism, enlarging jewels, or changing angles of pallet stones, etc., etc., all of which I do as necessity demands, as well as the care of striking watches, fly backs, etc., which, too, I make a specialty of, and of chronometer escapement watches, which would take more space than I feel disposed to ask you to give me.—*American Jeweler*.

THE NEW CENTRAL RAILWAY STATION AT FRANKFORT ON THE MAIN.

THE new central railway station at Frankfort on the Main is one of the most imposing structures of modern times, not only as regards its dimensions, but also because of the effect which its architectural proportions produce upon the eye. Nobody looking at the long line of buildings surrounded by gigantic perron halls can help being impressed with their grandeur. The beholder, however, is not only struck by the general aspect, but also by the beauty of detail in this magnificent specimen of the Renaissance style. The interior of the perron hall shown in one of our engravings is especially impressive, and every one will admire the graceful outlines of the heavy iron structures in the upper part, which, in consequence of their enormous height, look from below like a spider web.

The base and the earth works were begun in the summer of 1881, and if we take into consideration the fact that 2,700,000 cubic meters of sand and gravel were necessary for the foundation, we will have some idea of the scale on which the edifice was undertaken. In 1883, the great hall, which has a width of 220 meters and which will shortly be opened to traffic, was begun. The perspective view of this portion of the station is given in one of our engravings. Inspector Eggert had the general management of the building, which was erected after the plan submitted by him, and which received the prize in the competition between the different architects. Herr Frantz, a distinguished engineer, who undertook the general supervision of the construction, had an important part in the execution of the entrance hall for the trains, and it was he, also, who built the perron hall, after designs of Herr Schwedler.

The middle part of the station, which contains the porch, the ticket offices, the baggage department, the police quarters and the telegraph offices, projects, as shown in the picture, considerably beyond the rest of the building, and by the distinct memberings of its moulding stands out conspicuously from the whole. Protruding portals of peculiar structure and corner pavilions enliven the aspect of the wings of the edifice, the great round arched windows of which are separated from each other by powerful stone pillars. The corner pavilions to the left in the view contain the so-called imperial apartments for the reception of royal travelers, and on the other side are the meeting hall and reception rooms of the different railway administrations. On the right and left of the imposing main vestibule, which is distinguished by the strength and the beauty of its style, lobbies with arched roofs lead to the waiting and dining rooms, the ladies' rooms, the imperial