Correspondence.

Concerning a Telescope of Unlimited Power.

To the Editor of the Scientific American:

In connection with D.'s communication, on page 368 of your volume XXIX., it may be observed that the mercury, revolving in the manner described, will have a stability due to its motion, above that belonging to it while in a state of rest. The same principle applies alike to the motions of atoms and of suns, and a very striking illustration is afforded by the rigidity imparted to a stream of water issuing from an orifice under great pressure. (See Mr. Emerson's communication, page 340 of your volume XXIX).

From lack of necessary data, the writer is unable to state the exact stability of mercury due to different velocities; but after a rough estimate, it is safe to say that, if the basin of 20 feet diameter be made to revolve at the rate of 200 revolutions per minute (which speed is practicable), the mercury near the circumference of the basin will have a stability greater than lead. Now, unfortunately, the velocity at the center of the vessel will be 0, and consequently the stability at the center will be only that due to mercury in a state of rest. It is possible that we may dispense with a portion of the center of the mirror; perhaps some one will be kind enough to tell us how much, if any, may be dispensed with, without seriously impairing its efficiency.

The great amount of power required to operate the necessary machinery would preclude the possibility of using weights for imparting motion, and the next best thing that we have is an accurately balanced water wheel, imparting its motion through friction wheels. After reducing the possibility of friction to a minimum by accurate balancing, etc., we may obviate still further difficulties arising from vibrations and inequalities of motion by floating the vessel, containing the mercury destined to act as a reflector, in another vessel also containing mercury. The motion would then be imparted through the mercury in the outer vessel by friction to the mercury in the inner vessel. The consequences of this arrangement are obvious.

In regard to the plane mirrors, will some one well acquainted with the principles involved be kind enough to inform us if it is necessary that they should be quite as large as the parabolic reflector?

The oxidation of the mercury would be an item requiring attention. It might be prevented by covering the metal, while at rest, with a suitable oil, which would separate itself from the mercury while in motion. JOHN LINTON.

Baltimore, Md.

Heat and its Origin.

To the Editor of the Scientific American:

The origin of the heat developed during combustion has hitherto been a profound mystery. In the beginning of this century, it was suggested that a portion of the specific or of the latent heat of the bodies consumed was set free during the process of combustion; but this idea was soon overthrown, as it was found that the products of combustion often possess more specific heat, and almost more latent heat, than the bodies themselves did before burning, that is, before chemically combining under evolution of heat. Hence arises the question: Whence comes all this intense heat of combustion, and the subsequent great amount of latent heat, when the resultant substance in the end possesses more specific heat than its elements before combination? It is curious to remark that, in this case, the most eminent physicists concluded that combustion must be an electric phenomenon. That ignorant persons, knowing nothing of electricity, attributed the so-called spirit rappings and similar manifestations to its agency may be readily comprehended; but that scientists who have studied its laws should use this word as a pretext for explaining fire, solar heat, volcanoes, and even earthquakes, seems almost incredible. Physics form a positive science, which does not admit of vague suggestions, and a phenomenon cannot be ascribed to the work of electricity unless it is clearly shown that the well known laws and properties of electricity, when applied, explain every peculiar phase of the same. Notwithstanding that the laws of heat and electricity have been thoroughly investigated we are as yet not sure of their ultimate nature; one thing only appears certain, namely, that both are not peculiar fluids penetrating matter, but mere motions of the molecules or atoms of ponderable matter. Therefore, it is inappropriate to speak of imponderable matter, on account of the contradiction in terms, as the first property of matter is to be ponderable; we may have imponderable forces, or, better, caloric and electric forces. The so-called ether, which fills the planetary space and propagates heat and light, is probably ponderable matter; it is an atmosphere surpassing hydrogen in brightness more than hydrogen surpasses platinum, and of so small a gravitating force that millions of years will elapse before it is condensed on the planets. In fact, the spectroscope shows that, in the atmosphere of the planets and even of the sun, the materials of our earth's atmosphere are present, including water or its elements. Recent investigations of the sun and other heavenly bodies, by means of this wonderful apparatus, have besides revealed the fact that all matter may be in a more than gaseous condition, incandescent gas of so high a temperature that the elements are dissociated, that is, that all chemical affinities are destroyed, and each element exists separately in its uncombined condition, notwithstanding that it is intermingled with others A descent from this exceedingly high temperature to that in which the chemical affinities can manifest themselves results in the combination of the gases. The chemical affinities of the different elementary substances manifest themselves only between a comparatively limited range of temperature, below and above which they do not operate. Even as at an extreme cold no combinations can take place, so at the extreme heat, of say 8,000° Fahrenheit, not only no combustions take place, but all compounds are separated into their ultimate elements. On cooling and reaching 4,000° or 3,000° or thereabouts, the volatilized substances or gases will again combine; the chemical affinities come into play, and combustion will ensue, the heat of which will again originate partial new dissociations. This is what continually appears to take place in the sun. It has been proved that the work of dissociation is strictly analogous to that of evaporation. In imparting to a liquid, water, for instance, the property of gaseous elasticity, steam, a definite quantity of calorific energy is manifested in the newly acquired expansive power, and therefore is not displayed as temperature; in other words, heat is made latent when changing water into steam. In like manner a still larger amount of temperature is converted into the force necessary to separate the vapors into their component gases; here a greater quantity of heat is made latent, and this is that which is set free and appears in combustion when the gases combine by burning, just as latent heat is freed when gases condense into a liquid, and again when the liquid cools into a solid. In regard to the temperature of the sun, we know now that those substances most prominent on our earth exist there in a state of vapor. Iron, lime, soda, potash, etc., are there in that condition, and also steam in the dissociated state of oxygen and hydrogen. Therefore the actual temperature must be several thousands of degrees, in fact, such a heat as we cannot practically produce. Direct measurement caused Sir Isaac Newton to conclude that the sun was thousands of times hotter than melted iron, while Sir John Herschel supposed that it was a solid or liquid body, radiating from its surface only, and that its temperature ought to exceed thirteen million degrees Fahrenheit. Modern discovery has shown, however, that the sun is gaseous at least to a depth of several thousand miles, and that the gas is all incandescent, luminous, and hot.

Moreover, incandescent gases and flames are perfectly transparent for light and heat from lower strata, and therefore the solar rays not only come to us from the surface, but we receive the accumulated rays from layers of incandescent gases several thousand miles in thickness. From the effects of these gases, the surface of the sun is continually being disturbed in a manner compared to which the more violent hurricanes, thunderstorms, and volcanic eruptions on our earth sink into utter insignificance. X.

The Prismoidal Railway.

To the Editor of the Scientific American:

Observing in your journal of December 13, 1873, an article, copied from the *Public Ledger*, referring to Crew's prismoidal railway, we beg to call your attention to an error which we will thank you to have corrected. The error lay in the statement that "the track upon which the trial was made, contained 36 feet lumber and 18 pounds of iron to the lineal foot;" it should read "lineal yard." We beg further to inform you that, by consent of the President of the Atlanta and West End Street Railway Company, Atlanta, Ga., for whom the locomotive was built, Mr. E. Crew, the patentee, has been allowed its use in order to demonstrate its power and the principle of his railway on a track of 500 feet circumference, now building at the Chestnut street rink in our city, which he has rented for that purpose; where, in the course of a couple of weeks, he intends to bring it directly before the attention of railroad men and corporations. The prism of this trial railway is 24 inches wide at base, with 18 inches hight to top of cone, with an 18 lbs. rail on its apex. The curves will be of 37 feet radius, and he purposes to demonstrate his principle, starting on a trip of 500 miles.

We enclose you a photograph of the "Atlanta" locomotive which is now at the rink. It is 11 feet long, 4 feet wide, and has two 24 inch drivers, with cylinders 5 × 8, and weighs only 4 tuns.

We contend that, by the use of the prismoidal railway, rapid transit can be insured between the cities of New York and Philadelphia, and the time reduced to 1½ hours.

Philadelphia, Pa. GEO. W. PRICE & CO.

The Relative Efficiency of Engines and Boilers.

To the Editor of the Scientific American:

The question of the relative economic efficiency of modern engines as compared with that of boilers, as they are now constructed, is being agitated among engineers in this city, and it has occurred to me that it is a subject that will interest the readers of your valuable journal. The discussion arose from a statement, made by one engineer, that, whereas the best modern steam engines have frequently developed from 75 to 85 per cent of the power actually furnished by the boiler, the boiler does not develope more than 15 per cent of the power actually contained in the carbon fuel. This was objected to, the reverse being claimed as being nearer the truth. Discussion on this subject in your valuable journal would be highly appreciated by the public, who well know that you are desirous of obtaining as much light as possible on all scientific subjects, and especially on steam, which enters so largely into all concerns of our daily life.

Boston, Mass. CONSULTING ENGINEER.

REMARKS BY THE EDITOR:—The subject here suggested is one of interest, and we invite correspondents to give their views.

THE Parisian pharmaceutists have contrived to incorporate cod liver oil with bread. Each pound of bread contains a little more than two ounces of the oil.

ALUMINA, FROM THE CLAY TO THE SAPPHIRE.

READ BEFORE THE POLYTECHNIC CLUB OF THE AMERICAN INSTITUTE, ON DECEMBER 18, 1873, BY DR. L. FEUCHTWANGER.—PART I.

Alumina is the oxide of the metal aluminum. It occurs in nature as corundum, which is an extremely hard mineral, ranking next to the diamond, its specific gravity being 4·0. It consists of 53 per cent aluminum and 47 oxygen. The precious gems sapphire and ruby are the representatives of pure alumina, the first of a blue and the other of pink or rose red color. If they possess a stellated opalescence, when viewed in the direction of the vertical axis, resembling a star, they are called star sapphires or rubies, which were known to Theophrastus and Pliny in the first century. The mineral corundum occurs in very fine crystals of the blue and red colors in many localities of the United States, such as New York furnishes at Amity, New Jersey at Newton, Pennsylvania at Unionville, and North Carolina. At Franklin, an extensive quarry of the crystals is now mined, one crystal weighing 30 tuns. Georgia gives red sapphires, of which California and Canada both furnish fine specimens. The minerals gibbsite and diaspore are hydrates of alumina; but the mineral emery, which stands near corundum in hardness and is the most useful material in the arts, containing the alumina and magnesia in about equal proportions, was originally brought from Asia Minor, but is now extensively mined at Chester, in Massachusetts. Alumina is also contained in a vast number of minerals. Clay is the result of the decomposition of aluminous minerals, and is, strictly speaking, a mixture of silex or flint, with at least one fourth of alumina, and has a peculiar earthy odor when breathed upon; and the mineral shale, which differs but little from clay, is extremely infusible and insoluble, and is also the companion of the silicated minerals: any earth which possesses sufficient ductility, when kneaded up with water, to be fashioned like paste by the hand, is called clay. These clays vary greatly in their composition, and are nothing more than mud derived from the decomposition or wearing down of rocks, as we see by the rain drop impressions, ripple marks, or mud cracks, which bear marks and evidence of exposure above the water, indicating plainly the long time which was required for the decomposition of the felspathic rocks, mostly contained in granite, and of granitic and gneissoid rocks and porphyry. In some regions where these rocks have decomposed on a large scale, the resulting clay remains in vast beds of kaolin mixed with pure quartz or silex, and sometimes with oxide of iron from some of the other minerals present, such as we find extensive beds of in the tertiary formation, as in New Jersey, Virginia, and South Carolina.

Before proceeding further to state what function the component parts of granite, which are the quartz, felspar and mica, occupy in the aluminous silicates, let me say a few words on the classification of rocks according to their origin and age, meaning the earth's crust, of which but a small portion is accessible to human observation. All rocks are divided into four great classes according to their different origin. The first are the aqueous; second, volcanic; third, the plutonic; and fourth, the metamorphic. Each of these four distinct classes has originated at many successive periods. It was formerly supposed that all granites, together with the crystaline or metamorphic strata, were first formed, and were called, therefore, primitive rocks, and that the aqueous and volcanic rocks were afterwards superimposed, and would rank, therefore, as secondary in the order of time. The aqueous rocks are also called the sedimentary or fossiliferous, and cover a larger part of the earth's surface than any others; they consist chiefly of mechanical deposits, such as pebbles, sand and mud, but are partly of chemical and some of organic origin, especially the limestones; they are called the stratified rocks, meaning strata which have been produced by the action of water. We have adopted these names of formations, such as the stratified and unstratified, fresh water and marine, aqueous and volcanic, ancient and modern, metaliferous and non-metaliferous formations.

The volcanic rocks are those which have been produced at or near the surface, whether in ancient or modern times—not by water, but by the action of fire or subterranean heat. These rocks are, for the most part, unstratified, and are devoid of fossils; they are the results of volcanic action and of craters more or less perfect; they are composed of lava, sand and ashes, similar to those of active volcanoes; and streams of lava may be traced from high summits or cones into adjoining valleys; and earthquakes have produced erosions, fissures and ravines (whereby we can detect porous lava, sand and scoriæ), dikes or perpendicular walls of volcanic rock, such as are observed in the structure of Vesuvius, Etna, and other active volcanoes. The basaltic rocks, forming the rocks of Staffa and of Giants' Causeway, are all volcanic; they have in their mineral composition much resemblance to the lavas, which are known to have flowed from the craters of volcanoes.

The plutonic rocks, which comprise mostly the granites, etc., differ much from the aqueous and volcanic; they are, in common with the next class, highly crystaline and destitute of organic remains; the plutonic comprehend all the granites and certain porphyries, which are nearly allied in some of their characters to volcanic formations. The metamorphic rocks, however, are stratified and often slaty, and are called by some the crystaline schists, in which are included gneiss, micaceous schists, hornblende schists, statuary marble, the finest kinds of roofing slate, and others. All the various kinds of granites which constitute the plutonic family are supposed to be of igneous and aqueo-igneous origin, and have been formed under great pressure at a considerable depth in the earth, or under a certain weight of incumbent ocean. Like the lava of volcanoes, they have been melted and afterwards cooled and crystalized, but with extreme slowness and under conditions different from those bodies cooling in the open air; they differ from volcanic rocks not alone by their crystaline structure but by the absence of tufa and breccias, which are the products of eruptions on the earth's surface or beneath seas of little and inconsiderable depth.

The metamorphic or stratified crystaline rocks form the fourth and last great division of rocks, comprising the gneiss, mica schist, clay slate, chloritic schist, marble and the like, the origin of which is more doubtful than that of the other three classes. They contain no pebbles or sand or scoriæ, and no traces of organic bodies, and are often as crystaline as granite, yet divided into beds corresponding to sedimentary formations, and may be called stratified. The materials of these strata were originally deposited from water in the usual form of sediment, but were subsequently so altered by subterranean heat as to assume a new texture. It may be proved that fossiliferous strata have exchanged an earthy for a highly crystaline structure, even at some distance from their contact with granite; hard clays containing vegetable or other remains have been turned into slate, called the mica schist or hornblende schist, and every vestige of the organic bodies has been obliterated.

All the crystaline rocks are of very different ages, sometimes newer than the strata called secondary, and we must infer that some peculiarity must exist which is equally attributable to granite and gneiss, or in other words to the plutonic and altered rocks, which are distinguished from the volcanic and the unaltered sedimentary rocks; and that the granite and gneiss and the other crystaline formations are hypoaqueous, or rocks which have not assumed their fossil forms and structure at the surface, and occupy the lowest place in the order of superposition.

The composition of granite, as already stated, being quartz, mica and feldspar, the two last named ingredients contain the alumina in the form of silicate of alumina in nearly equal proportions, and some contain also some alkaline ingredients; likewise mica consists of a silicate of alumina and another alkali, differing somewhat from those contained in the felspar; we have, for instance, the anorthite, a lime felspar, the labradorite, a lime and soda felspar, the oligoclase, a soda lime felspar, the albite, a soda felspar, the orthoclase, a potash felspar; while the mica group, such as the phlogopite, biotite, muscovite, lepidolite, and others contain about twenty per cent of alumina, and about thirty per cent magnesia in their compositions. Felspar, like adularia, amazonstone and labradorite, when polished, form ornamental minerals; the garnet, likewise a silicate of alumina, when cut and polished, forms a gem; so is the lapis lazuli a silicate of alumina, an ornamental stone furnishing the natural ultramarine blue colors. The turquoise, one of the genus, is of blue color, but is a phosphate instead of a silicate of alumina, while another interesting mineral, called wavellite, contains this alumina. The beryl and emerald are silicates of alumina oxygenated, the latter colored with oxide of chrome; and the first, when cut and polished, has the name of aqua marina, and is a fine gem.

A vast number of minerals composed of alumina and silica are found in nature, which find much useful application in the arts and manufactures; the mineral cryolite from Greenland, which is an aluminate but not combined with silica, is a fluoride of aluminum and sodium, is exported to many parts of the world and furnishes the material for alumina compounds.

Common slate, fuller's earth, pumicestone, marl, loam, ocher, umber, and sienna are more or less clays or silicates of aluminum, the three latter being colored by oxides of iron and manganese.

The topaz, a beautiful gem, is a silicate and fluoride of alumina. The great family of zeolites, which are composed of hydrous silicates and represent a very interesting class of minerals, are all chemical compounds of alumina with silica; most of them contain also a considerable portion of water, and lime, soda and potash.

Clay, which is found in nature in very extensive deposits, and if of very fine quality and texture is called kaolin: and the other varieties, such as common pipe clay, fine clay, Stourbridge, marl, or loam clay, and claystone: is of the same chemical composition as regards the silicate of alumina; some contain more iron, and some contain lime and the alkalies soda and potash; all, however, owe their existence to the decomposition of the granitic rock which, through many causes, either chemical or mechanical, or through the action of atmospheric air for many ages, has gradually become disintegrated; and as Brogniard found in France the granitic rock in such a condition, he called it "*la maladie du granite.*" The rock may gradually wear down either by variation of temperature or glacial action, or by congelation of water within the rock, gradually producing a split and expansion. In a chemical point, water itself may produce a powerful metamorphosis; as it contains carbonic acid, it would probably act upon the alkalies in the felspar of the decomposing granitic rock, while the silicate of alumina and the free silex would subsequently be separated by the action of water; the former, being so much lighter, would soon be washed away from the heavier silex, and after separation the clay is deposited. Very striking demonstrations of the decomposing granitic rocks may be seen in New York city, particularly in the upper part; there is a ledge of granitic rock extending from east to west, beginning at 31st street west to 60th street north; the Croton aqueduct in 42d street and Fifth avenue has been built from a granite quarried near 48th street and Tenth avenue; while on the east side, above 50th street, the gneiss rock caps the granite.

INSIDE A CHURCH ORGAN.

It is questionable whether any more magnificent specimen of human mechanical skill exists than the grand organ. The builder must unite, in his single person, the three capacities of artist, of scientist, and of workman: of the first, in order that he may possess the delicacy of ear to appreciate minute shades or variations of musical sound; of the second, that he may know and investigate the principles of acoustics which govern the productions of melodious vibrations, and the theories to be followed in constructing the apparatus from which the same may be elicited; and lastly of the skilled artificer, in order that he may contrive and invent devices for rendering the harmonies, latent in his assemblage of pipes, levers, and keys, responsive to the touch of the musician. It may seem almost a shattering of one's favorite mental idols to break down the divinity which, as the king of instruments, hedges around the organ: indeed, the dry details of levers, springs, and bellows, seem inappropriate and incongruous in connection with those grand tones which peal forth in the solemn chords which excite our reverential feelings as we kneel in the sanctuary; but Science is utterly destitute of sentiment. With imperturbable calmness she mercilessly resolves the daintiest melodies of Mendelssohn or Schumann, or the most majestic of choruses of Handel or Beethoven, into mere vibrations of the air, prolonged through certain intervals and in certain tubes, or leads us off from the reverie into which we fall over some exquisite harmony of the great tone masters into abstruse calculations as to the percentage of power due to the food absorbed by the organist *plus* the blower, which, converted into heat, is reconverted into motion by muscular action, which is again communicated to levers, etc., and which ultimately reappears in the shape of sound, and is again converted into motion when vibrating the auditory nerves.

We recently spent a pleasant half hour inside an organ. We climbed ladders and mounted platforms, and enjoyed the novel sensation of standing in a small grove of tubes, where big pipes were the large trees, and the little ones, the under brush; and looking back it seems as if we investigated enough levers, springs, and rods to establish a moderate sized piano manufactory. We puzzled over the arrangement of pedals, couplers, and stops, and became hugely impressed with the skill which enables a single mortal of ordinary construction to play on so many things at once; and finally discovering some novel and really ingenious appliances which, the builder informed us, were not furnished to organs in general, we obtained through the kindness and courtesy of that gentleman the following interesting particulars:

Let us premise by observing that the instrument which formed the object of our visit is located in the church of the Holy Communion, corner of 20th street and Sixth avenue, and that it has just been completed by Mr. Hilborne L. Roosevelt, of No. 40 West 18th street, in this city. Mr. Roosevelt is one of the youngest of American organ builders; but if we may judge from the magnificent tone and almost perfect mechanism, coupled with devices of no mean inventive skill, which we find in his latest production, we may fairly assume that he has reached a foremost place in his arduous profession. His plan is to combine the best points of all schools, English, German, and French; and hence the brief sketch which we give of the arrangement of the organ in question may perhaps be considered as including many of the latest improvements of the manufacture.

Everyone knows that if power be communicated indirectly, the necessary mechanism for turning corners, etc., necessitates a certain amount of frictional loss and resistance, greater, of course, than if the force was applied directly from the motor. Add to this the fact that the latter is weak, and, moreover, acts at a disadvantage, and an outline may be gleaned of the difficulty of actuating the multitudinous valves and levers of an organ, by compound levers connecting with key boards, say forty feet off, governed by the fingers of the organist. There is both a strong resistance to digital pressure, necessitating great exertion on the part of the performer, and also there exists an appreciable lapse of time between the touching of the key and the evolution of sound. The improvement which avoids this trouble is called the "pneumatic lever," and its effect is such that the keys are as easily manipulated, even with the full power of the instrument in action, as those of an ordinary pianoforte, while the interval of time between touch and sound, is barely ⅛ second, which is of course practically inappreciable. In the church above noted, the organist's seat is on the ground floor, while the instrument is in a gallery. The levers from the inner extremities of the keys pass down under the flooring to a box directly beneath the loft. Here, arranged in framework, is a series of little bellows, one for each key of the organ; and in one end of each of which is a valve, operated by a lever leading from the key board. This is so adjusted that, on pressing down a key, compressed air enters the corresponding small bellows and inflates it. As the bellows enlarges, it pulls upon a lever that opens the valve connecting with the proper pipe. It will be noted that no pressure is needed on the key, except such as is necessary to lift the small bellows valve, which is of course a very inconsiderable amount.

This set, or rather these sets, of bellows, for there are two, one belonging to each bank of keys, must not be confounded with the main bellows which supplies the air blast. This apparatus is situated in the loft near the organ, and is operated by man power, forcing a powerful current of air, not directly to the pipes, but into another bellows which serves as a regulator, securing a constant, instead of an intermittent, blast, and thus preventing the disagreeable, wheezy, and unequal tooting sound often noticeable in old and imperfect instruments. The blast is finally driven into a reservoir, whence it emerges into the pipes in the manner presently to be described.

Each key board, and there may be several, belongs to an entirely separate organ, so two or more instruments may, by ingenious inter-adjustment, be combined in one and the same case. In the organ in question, there are two key boards proper, though the pedals, worked by the feet, may be termed a third; and there is another called the electro-melody, so that in fact, with two key boards and one set of pedals, the player performs upon four separate and distinct organs at will, any combination of that number, or all together. The pedal organ is merely an assemblage of low pitched pipes; and on its mechanism, it is unnecessary to dwell. The great organ is the lowest bank of keys, which connect, as before noted, with pneumatic levers. Just above the receptacle for the wind is the wind chest, which may be likened to a long shallow box, divided by numerous longitudinal partitions, making troughs. In these partitions are set the pipes, each longitudinal row of which is called a register. The lower ends of each set communicate with a compartment of the chest, and the apertures are closed by spring valves. Now, if there were but one set of pipes, each key would through the pneumatic lever, communicate with one of those valves, and hence would necessarily sound but a single tube; but there are, as we have already stated, many rows of pipes, and hence one key not only works one valve, but several, ranged in a transverse line directly across the wind chest. That is, while a single key may sound first a fundamental note belonging to a chord which is found in one register, it may open simultaneously valves belonging to tubes in other registers parallel thereto, so as to admit air, and thus produce notes having certain harmonic relation to the key note; so that in fact by a single pressure of the finger, if we so desire, we may produce a chord or portion thereof, instead of a single note, as on a piano. Each trough in the wind chest of course belongs to one set of pipes, and has its own valve, so that the organist, by means of handles near his key board, called "stops," may admit the blast into one or any number of the channels, and thus sound any register or registers he may desire. The total compass of each register, in the great organ portion of the instrument we are describing, is 58 pipes, and there are twelve stops, allowing a selection of any of that number of registers. But these latter all differ in quality of tone; for instance, one is a harmonic flute, another a trumpet, a third a clarion; in fact each has its own voice, due to the construction of the pipes. The pedal stops are arranged in similar manner, and number five in all, while the swell organ, which is operated by the second or higher key board, has a similar number of pipes, with a set of eight stops peculiar to itself. The swell organ must here be explained, as used for *diminuendo* or *crescendo* effects. It consists in mechanism similar to that already described, but enclosed in a tight box, the sides of which are made like Venetian blinds. By opening these shutters, more or less, the organist can allow the whole sound to emerge, or can confine it, and so deaden it in the closed case. The electro-melody organ is an entirely novel invention of Mr. Roosevelt, of which it would be hardly possible to convey a clear idea without engravings. It is, as we have stated, a separate little organ by itself, and is designed to carry the notes of a melody or air, in a tone easily heard above the accompaniment, and so prove very useful in congregational singing. It is connected to the upper half of the key boards, and with a Leclanché battery. Each key, on being pressed, establishes a current which magnetizes an electro-magnet and so opens the valve of the proper pipe. The peculiar point, however, lies in devices which prevent any but the upper or melody note being heard. Thus, if we strike the chord C E G C, the upper C alone could be heard, if we allowed that note to rise, then only the G, and thus throw out any number of tones. This invention is highly ingenious, and though really very simple, quite difficult to solve at first sight.

There are many other appliances which we may briefly notice in conclusion. Among them are four couplers, by which the pedal great, and swell organs are connected, as may be desired, by a mere pressure of the finger of the organist on a button just above his key board. There are besides, five combination pedals, for drawing out the full power of the instrument, or full or part power of each integral portion. Then there is the usual tremolo arrangement, and various other refinements, which, though interesting to the musician, might fail to be appreciated by the general reader.

One of the most interesting applications of electro-magnetism, it may be remarked, is to the church organ, and we are aware of instances of its use to much larger extent than in the electro melodic sub organ noted above. In fact, one of the principal churches in this city has two complete organs, one being on each side of the chancel, and entirely distinct from the other. A single keyboard communicates directly with one, but operates the other by the electric current and magnets acting on the valves; so that if desired, the choir may be divided, half on each side, and yet both parties be enabled to sing in correct unison with the instrument. There are other points relating to organ improvements and manufacture, which space prevents our here dwelling upon, and to which we shall allude at an early date.

The Balloon Advertising Dodge Rejected.

The Commissioner of Patents has rejected an application for a patent for the broad idea of attaching advertisements to balloons, for the reason that a balloon is a common object, upon which every person has the right to stick or paint advertisements if he wishes. In order to support a patent, the applicant must have invented something. It is not invention merely to put advertisements on balloons.