Why there are no Water-rats in Ireland.

In an interesting article on the vole or water-rat, by Mr. Grant Allen, in the English *Country Gentleman*, the writer discusses the question why certain animals, such as snakes, vipers, water-rats, etc., are not found in Ireland. For the real solution of the problem, he says, we must go back to the time when England, Ireland, and the Continent were united by a broad belt of land across the beds of the English Channel, St. George's Channel, and the North Sea. It is now an ascertained fact that in the very latest geological period, known as the glacial epoch, the whole surface of the British Islands (except an insignificant strip of the south coast) was covered from end to end with a deep coating of glaciers, like that which now envelops all polar lands, and while this condition of things prevailed there were, of course, no animals of any sort in all Britain, or, at any rate, none but a few Arctic types. After the ice melted, however, the existing British fauna, such as it is, began to occupy the land, and the fact that it did so is one proof, though by no means the only proof, that a communication with the Continent then existed across the bed of the North Sea. Now, the animals only pushed their way very slowly into the newly cleared region as the ice melted away, and the consequence is that only some forty kinds of mammals out of the whole European fauna had penetrated as far as England before the gradual submergence of the lowland belt separated it from the Continent by forming the inclosing arms of the sea.

But Ireland lies even further west than England, and there is reason to believe that St. George's Channel had all been flooded some time before the waves of the Atlantic broke down the last link between Dover and Calais. Accordingly, Ireland never got her fair share of land animals at all, for though the wolf and fox and the Irish hare and many other quickly migrating creatures had time to cross the intervening belt before the submergence, several smaller or slower creatures, including the vipers, did not get over the ground fast enough, and were thus shut out forever from the Isle of Saints. Among them were the whole race of voles, and that is the reason why Ireland to this day has no water-rats.

Catching Float Gold in Streams.

We often hear mining men tell of the large quantities of float gold which pass down the streams of this State where mining is carried on, or which receive the waters of other streams where men are mining. No one seems to have thought it possible to catch any of this float gold after it passed out of the sluices into the streams themselves. Yet in other countries the people avail themselves of the opportunity afforded on streams where mining is done to catch the float gold—for it really does exist. It has been found, for instance, at Charleston, New Zealand, that the gold does not all settle in the tail races, but that, in the union of the water of several tail races, a small percentage, well worth saving, floats away.

The gold is arrested by a method termed "fly-catching," which consists of a series of blanket-tables placed across stream, like wiers, so that the waters shall flow over each table in succession. The tables are washed in turn, and the gold is streamed from the sand and caught up by quicksilver. Many of these "claims" yield from $20 to $45 per week, with little labor. In the Charleston district referred to, fly catching has become quite an industry in itself, and no doubt there are quite a number of places in this State where similar stations could be maintained with profit.

The tables are constructed entirely of timber. Piles two or three feet in length are driven firmly into the bed of the creek, and on these are nailed lengths of stout quartering, covered over with one-inch boards laid close together, so as to form a smooth table. Pieces of lighter quartering are then placed over the boards from top to bottom, forming divisions about four feet in width. Blanketing or cloth—ordinary grain sacks opened out are frequently used—is next spread smoothly along these divisions and securely fastened down by small strips of wood. The tables vary in length from seven to twelve feet, and are placed in the creek at intervals of from sixty to a hundred feet, extending quite across the stream. The proprietors of these rights are said to realize during rainy weather very good returns, ranging from $10 to $30 a week, according to the nature of the workings on the banks above and the number of tables set in the creek. The tables are liable to damage by flood. The tables are made in compartments, and when the blankets are lifted out of one compartment, spare cloths are kept to replace those lifted. The men wash out the cloths once or twice a day, in a box by the side of the creek. The fine tailings pass over several sets of tables in their course down the creek.—*Mining and Scientific Press.*

AN $800 silver brick from the Pioneer Reduction Works was exhibited at Nevada City last week.

NEW FUEL ECONOMIZER.

It is a matter well understood among steam users and engineers that from 50 per cent to 75 per cent of the steam generating powers of coal are lost by the passing off of the gases and smoke in an unburnt condition, caused by lack of oxygen sufficient to produce combustion. By the use of one part steam to fifteen of hot air commingled and injected rapidly into the furnace by vacuum, the otherwise waste gases are ignited and economy effected.

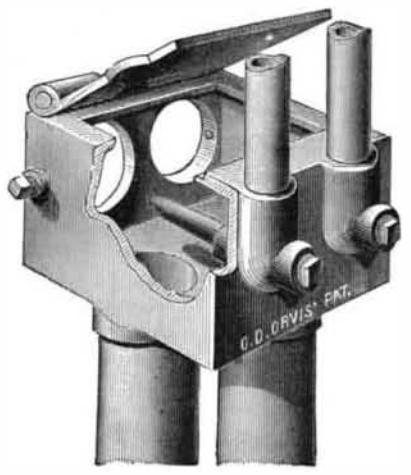

Fig. 2.—VACUUM CHAMBER WITH TWO STEAM JETS FOR INJECTING HEATED AIR AND STEAM INTO THE FURNACE.

When anthracite coal is burned, this attachment will, by the injection of hot air over the surface of the firebed, ignite the gases, utilize more completely the fuel employed, and, it is stated, show an actual saving of from 15 to 35 per cent. If bituminous coal is used, the economy will average about the same, with the additional advantage of burning all the smoke. The air is drawn through a heater in the asbpit, and projected into the combustion chamber by small jets of steam, as shown in Fig. 2.

The apparatus can be attached to any furnace in a few hours, without structural changes. It requires no fitting to or alteration of the boiler. It will invariably effect an economy in any grade or price fuel, varying according to condition of boiler, furnace, smoke stack, and fuel used. It will improve the draught and save the expense of high chimney stacks.

Practical experiments and exhaustive tests during a period of over two years both in this country and Europe, on various kinds of furnaces and fuels, have shown gratifying results in every instance.

This invention supplies the furnace by means of two vacuum boxes and four pipes opening into the fire chamber above the burning fuel. Through these pipes are introduced steam and heated air, that mingle with the heated gases arising from the firebed, and supply the requisite oxygen and hydrogen for consuming the gases and promoting perfect combustion.

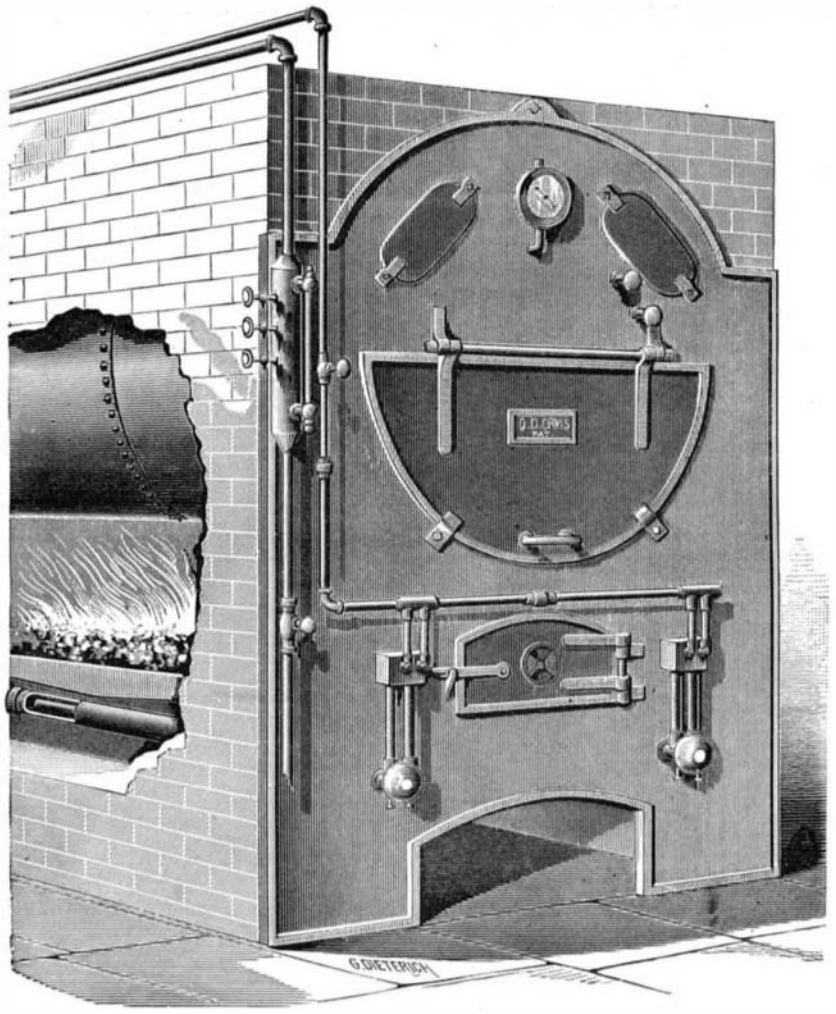

Fig. 1.—ORVIS COMBUSTION ATTACHMENT.

This invention is the result of protracted study on the part of the inventor, Mr. Orel D. Orvis, who is also a capitalist, and the president of the company. Six companies have been organized to work the patent in different parts of this country. The New Jersey company has already declared a dividend of five per cent. Further particulars may be obtained by addressing Orel D. Orvis, President of the New York Combustion Attachment Company, 261 Broadway, New York city.

How to Make Printing Plates from Photos.—The Asser Process.

A sheet of unsized paper—white blotting paper, in fact—was laid on a slab of plate glass, and dabbed over with a thin starch paste, a soft sponge being used for the purpose, and care taken to only apply so much starch paste as would fairly sink into the texture of the paper.

The sheet was next dried, after which it was sensitized by being floated (starched side downward) for five minutes on a five per cent solution of potassium bichromate, and it was hung up to dry in a moderately warm room. When dry, it was exposed under an ordinary negative for about two-thirds of the time which would have been required to obtain a silver print, after which the print—now of a light brown color—was soaked in water until all traces of unaltered bichromate were removed. The wet print was now partially dried by means of blotting-paper, and then exposed to the air until dry, after which it was laid between sheets of ordinary white paper, and well ironed with an ordinary flat iron, heated to about 150° Centigrade; the object of this proceeding being to harden the altered starch, and to enable it to hold the fatty ink firmly.

The sheet was next moistened, laid on a sheet of damp blotting-paper, and inked by a velvet roller charged with rather thin lithographic transfer ink. This ink adhered to the exposed portions, which refused to take up water, as a kind of granular deposit, leaving the thorough damp portions of the paper clear and white. The stippled ink picture thus obtained was then laid on a cleaned zinc plate, and etched into relief.—*Photographic News.*

"Compound Oxygen."

Compound oxygen is a trade name given to various compounds of secret composition and of boasted medicinal qualities. Several varieties have been analyzed by Prof. Prescott, of the University of Michigan, and his results are published in the *Physician and Surgeon* of Ann Arbor.

1. COMPOUND OXYGEN. *Keep Dark.*—A colorless aqueous solution of nitrate of ammonium and nitrate of lead, the two salts being in nearly equal proportions, and together forming about three per cent of the solution.

2. OXYGEN AQUÆ. *For Digestion. Keep Cool.*—One of the grades of "compound oxygen." A colorless, odorless, and tasteless liquid—found to be water, of a commendable degree of purity, quite free from sophistications. Probably this is the original compound oxygen.

3. COMPOUND OXYGEN. *Dr. Green's,* 1880.—An aqueous solution of nitrate of ammonium, with a very little nitrate of lead.

4. COMPOUND OXYGEN. *A White Crystalline Solid.*—Obtained for analysis about five years ago, and then found to be nitrate of ammonium alone. "Contains all the vitalizing elements of the atmosphere, but combined in a different way."

5. COMPOUND OXYGEN.—Sent out from Boston. A colored, fragrant liquid, consisting of alcohol, chloroform, and balsam of tolu.

6. COMPOUND OXYGEN. *Dr. O'Leary's.*—Contains alcohol, chloroform, bitter almond oil, balsam of tolu, and red coloring matter.

The first two samples, Compound Oxygen and Oxygen Aquæ, were sent to Prof. Prescott for analysis by the editor of *Good Health,* who remarks as follows:

"It should be recollected that this solution is to be used by inhalation, a teaspoonful being added to a small quantity of warm water, through which air is drawn by means of a glass tube. Neither of the substances contained in the solution are volatile at the temperature at which the solution is used, so that it is impossible for any medicinal property whatever to be imparted by this boasted remedy, except what comes from the warm water, which is itself very healing when used in this way, as we have demonstrated in hundreds of cases. Prof. Prescott also tested the vapor given off from the pure solution when it was boiled, but found nothing more than the vapor of water.

"The Compound Oxygen is usually accompanied by what the manufacturers are pleased to call Oxygen Aquæ, which they recommend their patients to take as an aid to digestion. The analysis of this showed it to contain nothing but water. The most careful tests revealed nothing else."

Specific Heat of Gases.

The author has verified the identity of the specific heats of hydrogen, nitrogen, oxygen and carbon monoxide gases at temperatures up to 2,700°.—*M. Vieille, in Comptes Rendus.*

London Furniture Exhibition.

The Third Annual Furniture Exhibition, held at the Agricultural Hall, closed on May 16. The *Journal of the Society of Arts* says the main building was largely devoted to what we chiefly understand by furniture, that is, upholstery; and a considerable variety of objects and styles of decoration were exhibited. In the sides and in the galleries a very liberal interpretation of the term furniture was taken, but as in the Building Exhibition the main feature was structural, so in this exhibition the objects were chiefly connected with the contents of the structure. This classification did not, however, entirely hold good, for greenhouses and horticultural buildings generally had a special division set apart for them.

A considerable number of wood working machines were shown in action, and numerous specimens of new processes of wood carving, by which lengths of mouldings can be produced at a small expense, were exhibited. In the King Edward's Hall, which was devoted to domestic appliances, were exhibited a large number of useful objects. Here were shown specimens of pottery made from iron slag, and decorated in green, blue, and brown colors; and basins, trays, waiters, etc., made from pulp by the Patent Pulp Manufacturing Company, which are said to be practically unbreakable. The galleries were devoted to pianos, of which there were a large number; to carpets, chairs, stoves, and also to some of the lighter objects for exhibition. Messrs. H. R. Willis & Company, of Kidderminster, showed a three-quarter Brussels power loom, by Messrs. John Crossley & Company, at work. The loom is constructed to weave Brussels velvet (or cut pile) carpet, and is provided with the necessary changes to weave ordinary loop Brussels by a special construction of the Jacquard, and it can be arranged to weave either five or six frame carpet.

Messrs. Cardinal & Harford showed a small loom for the making of Turkey carpets, brought from Koula, in Asia Minor. This is very roughly constructed of such materials as came to hand, the appliances being of a very rude character. It was intended to show this loom at work, but owing to the impossiblity of prevailing upon a Moslem family to leave Turkey, the idea had to be abandoned. The Institut de Sculpture sur Bois, at Brienz, sent over to the exhibition some native workpeople, who were to be seen at work in the west gallery, surrounded by specimens of the wood carving for which Switzerland is so famous. In the Oriental Bazaar, arranged by Messrs. Holme & Company, the various articles were set out in stalls, each of which was devoted to the town from which the articles are obtained or shipped; thus, under Tokio, was shown porcelain and pottery from Tokio, Ota, Satsuma, Kaga, etc.; under Canton, furniture, gongs, etc.; under Benares, chased silver work; under Karachi, Scinde pottery; under Bombay, carved sandal wood, and inlaid box work and furniture; under Constantinople, Syrian, Turkish, Bulgarian, and Persian embroideries; under Tunis, lanterns, slippers, etc., and so on, making eighteen Eastern towns in all.

Of other more general exhibits, mention may be made of various specimens of stained glass, and of the new imitation called "glacier," shown by Messrs. Perry & Company. This material is supplied in pieces of different sizes, and is affixed to the glass simply by wetting the glass uniformly and then applying the design. It is stated that it will not crack or leave the glass under the action of heat or moisture. A large collection of morocco leathers of special dyes were shown, as well as the new Caiman and Zeddo grains. The material called "veloplastic," which is made to imitate leather, silks, damasks, etc., is used for upholstery purposes, dressing bags, fancy leather goods, and even for bookbinding. The Yale Lock Manufacturing Company exhibited a large supply of their special locks and keys, among which was their time lock, which, isolated from an external communication, can be set to be opened at any predetermined hour.

Printing and printing processes were also represented in the exhibition. Messrs. Wyman exhibited the "Cyclostyle," a copying apparatus, the advantages of which are stated to be that (1) copies are in a permanent jet black color; (2) any number of copies, from 10 to 2,000, can be obtained from one original writing; (3) no washing, no damping, no melting, and no press required; (4) the original may be left for any length of time, and further copies taken from it when wanted; (5) the last copy is as good as the first.

The World's Inventors.*

Usually when a man has invented something novel and useful, and has obtained a patent therefor, he is possessed of a feeling of pride that raises him in his own estimation, and frequently in the estimation of some others, rather above the average of mortals. He imagines, or at least hopes, that his invention will prove to be a lever with which the world will be elevated to a higher sphere of usefulness and happiness, while at the same time and incident thereto he fondly dreams that he has entered on the high road to fortune and renown, and that he is to become a millionaire. He looks upon the letters patent that display the great American eagle in all of his gorgeousness, and that bear the signature of those high in authority, as a most precious document, that is either carefully laid away among his archives to be handed down to posterity, to show how great a man and how inventive a genius he was, or ornately framed and displayed in such manner that all may behold and admire. There is nothing wrong in any of this, but rather much that is commendable. Notable inventions have marked the march of civilization in all ages of the world, and the epochs of history are marked by great discoveries none the less important. In fact, discoverers and inventors should be classed together. Among the great discoverers of the world in physical geography the discovery of America by Columbus in 1492; of Florida by Ponce de Leon, 1512; and of the Mississippi River by De Soto, in 1541; and in the arts and sciences, of the circulation of the blood by Harvey, in 1619; of making pictures by the aid of light by Daguerre, in 1838; and of electricity by Franklin, 1752, were of the utmost importance to mankind, the beneficial effects of which are apparent every day. On the other hand, the world would not have arrived at the high zenith to which it has attained had it not been for the inventive geniuses who bestowed their wonderful gifts upon it. What would railroading be to-day without such an appliance for stopping the motion of trains as the air brake patented by Westinghouse in 1859, or steel rails, the cheap production of which was invented by Bessemer in 1856? The invention of breech-loading firearms, by Thornton and Hall, in 1811, revolutionized the methods of modern warfare, even as the invention of gunpowder by Schwartz, in 1320, compelled the abandonment of cross-bows, spears, and slings, and substituted the matchlock and blunderbuss. The second century of the Christian era (A. D. 130) witnessed the invention of the mariner's compass, without which Columbus would never have been able to find his way across the wide, wild western ocean, and without which, without any essential difference from that used by the ancient navigators, extended traffic on the ocean would be simply impossible. We all appreciate the value of Whitney's invention of the cotton gin, in 1794; of the grain binder by Gordon, in 1872; of the grain harvester, by Haines, in 1849; of the knitting machine by Lee, in 1589; of the common match by Walker, in 1829; of the mowing machine by Scott, in 1815; of the machine for making pins by Wright, in 1824; of the lumber planing machine by Bentham, in 1791; of printing by Gutenberg, in 1444; of the type-revolving printing press by Hoe, in 1847; of the safety lamp by Davy, in 1815; of the screw propeller by Stevens, in 1804; of the sewing machine by Howe, in 1847; of the first successful steamboat by Fulton, in 1808; of the first successful steam engine by Watt, in 1744; and of practical telegraphy by Morse, in 1837.

The world appreciates all these inventions and thousands of others of greater or less usefulness, and from which the inventors in many instances have obtained both fame and great pecuniary reward. And the field is a wide one yet, open and free to all, with as large possibilities for the future as the past has shown.

But there are thousands of inventors, who have never realized as much on their inventions as their letters patent cost them, and never will; not always because of lack of intrinsic merit, but that their merits were not properly made known to the public. A man who may have a patent for a thing, no matter how valuable it may be, and does not direct public attention to it—does not "push" it—resembles the man spoken of in the Bible, who wrapped his talent in a napkin and hid it in the earth. It occurs to us that the talents all men possess to greater or less degree, particularly as regards their capacity for business—their adaptability for transacting the affairs of life—are very much like the inventions of men. One man may possess sufficient talent to make him a successful merchant, or manufacturer, or mechanic, or artisan, and by "pushing" it he attains to eminence in his profession, while another with equal talent, who does not "push" it, lags behind in the race of life, and when the end comes is like the man who hid his talent in the earth. It is folly for any man to say he can never find employment, if he is possessed of average intelligence, sufficient education, good character, and an abundance of "push." With these qualifications entrance can be gained into almost any office, store, or workshop in the land, but the "pushing" must be done, even as the owner of a valuable patent must "push" it before he can hope to realize any profit therefrom.

* *The Age of Steel.*

Protoplasm.

Dr. Dolley, of Rochester, has lately translated an interesting article from the German of Dr. T. W. Engelmann, of Utrecht, entitled "The Physiology of Protoplasmic Motion." The introductory portions repeat the familiar descriptions of the physical and chemical properties of protoplasm, and its peculiar and mysterious motion. From succeeding sections we gather the following instructive particulars, all of which has not the recommendation of newness, but seems to bear the warrant of established facts:

Temperature.—For all contractile protoplasm there is a higher and lower temperature at which the spontaneous movements cease; the minimum lies mostly in the neighborhood of 0° Cent., and the maximum about 40° Cent. There is a certain high temperature at which motion reaches its maximum. This is called the optimum temperature, and lies usually several degrees below the maximum. The maximum temperature produces heat rigidity, or heat tetanus, at which point protoplasm contracts, becomes motionless, and remains contracted as though held by strong artificial stimulants. On cooling, motion is again resumed. But too long warming produces death—coagulation.

There is also for all protoplasm a maximum and minimum capacity for the inhibition of water. The minimum may average below 60 per cent, and the maximum over 90 per cent.

At a maximum, movement ceases. This is called wet tetanus. There is also dry tetanus, at which point, owing to the absorption of water below the amount which insures movement, all motion stops. Protoplasm which has been completely dried in the air at ordinary temperatures may revive even after years upon remoistening.

It has been kept in sea water, so reduced through evaporation as to contain 10 per cent of salt.

It survives but a short time the absence of oxygen. High atmospheric pressure arrests the motion of protoplasm, and diminished pressure above a certain limit hastens it, or permits it to remain unchanged. Hydrogen acts fatally and causes death. The spontaneous movement of protoplasm is interfered with and prevented unless the fluid remain neutral, a slight excess of alkali and especially of acid producing stagnation. In dilute caustic alkalies protoplasm swells very much, and finally dissolves and flattens. In dilute acids death begins with turbidity and shrinking. The vapors of ether and chloroform, even when very greatly diluted by common air, produce coagulation, though if quickly removed pure air will again restore motion.

Veratrine acts quickly and its effects closely resemble those produced upon the "contractile substance of muscle." Quinine appears also to exercise striking toxic qualities in its effects upon protoplasm.

Irritants, such as changes of temperature, electrical and mechanical shocks, and even sudden illumination, affect the protoplasmic mass; their effects varying with various circumstances, as strength and character of irritation, unequal application of the excitant to different parts, and the nature of the protoplasm chosen. "Usually the result of artificial irritation expresses itself in that the protoplasmic parts directly reached by the irritant, transiently and without marked change of volume, draw themselves together, exhibiting the smallest possible surface, in a manner similar to an irritated muscle and strive to assume a spherical form." The theory offered by the author of the peculiar and hitherto unexplained motion of protoplasm, is that the mass is made up of molecular units which he terms inotagmen, which have in themselves powers of contraction and mobility, whereby the whole body of which they are parts is set in motion, upon the more or less rhythmical or axial motion of these monads, which bear to the whole substance of protoplasm some such relation as is borne by the constituent molecules of a crystalline body to the body itself. L. P. G.

Selecting a Horse.

The *Turf, Field, and Farm*, than which there is no better authority on the subject, says that "in buying a horse, first look at his head and eyes for signs of intelligence, temper, courage, and honesty. Unless a horse has brains, you cannot teach him to do anything well. If bad qualities predominate in a horse, education only serves to enlarge and intensify them. The head is the indicator of disposition. A square muzzle, with large nostrils, evidences an ample breathing apparatus and lung power. Next, see that he is well under the jowl, with jaw-bones broad and wide apart under the throttle. Breadth and fullness between the ears and eyes are always desirable. The eyes should be full and hazel in color, ears small and thin and thrown well forward. The horse that turns his ears back every now and then is not to be trusted. He is either a biter or a kicker, and is sure to be vicious in other respects, and, being naturally vicious, can never be trained to do anything well, and so a horse with a rounding nose, tapering forehead, and a broad, full face below the eyes is always treacherous and not to be depended on. Avoid the long-legged, stilted animal—always choosing one with a short, straight back and rump, withers high and shoulders sloping, well set back, and with good depth of chest, fore legs short, hind legs straight, with low down hock, short pastern joints, and a round, mulish-shaped foot."

Manufacture of Rubber Shoes.

The *Shoe and Leather Reporter* says that there are sixteen rubber boot and shoe factories in the country, nine of which turn out from 1,000 to 5,000 pairs daily and seven of them from 8,000 to 20,000 pairs, aggregating about 90,000 pairs a day, or 27,000,000 pairs a year. A great deal of attention is now bestowed on the style and finish of rubber shoes. Some of the specialties made by leading manufacturers are as handsome as any that are made of cloth or leather. The sales have been largely increased by these improvements. On the other hand the rubber shoe people aim to put into their stock the utmost amount of dirt that is possible; for the more dirt the less the cost to them.

Clerks and Mechanics.

An exchange says that recently there applied three hundred candidates in answer to a call for six clerks, and one hundred and thirty-seven proved to possess the necessary qualifications, and adds that "there is no such rush when capable mechanics are wanted" There is no parallel in the two cases. A large proportion of young men just from their schools are capable of performing the work of clerks, at least with the added experience of a few months, perhaps weeks, in mastering the details of the particular position. But the "capable mechanic" is the result of several years' apprentice service in addition to his school attainments.