The International Dairy Fair.

Cheese factories and creameries in practical operation constitute a special feature of the Dairy Fair in this city, beginning December 2, and continuing through the week. Three hundred gallons of milk and twenty-five gallons of cream are required for these operations. The entries of butter and cheese, each over 200 lbs. in weight, exceed 1,000, and the single packages will reach 10,000. One exhibit is a cheese weighing 1,500 lbs. A large display of blooded dairy cattle and dairy implements and machinery add to the interest of the fair.

The secretary has given the following statistics with regard to the importance and rapid growth of the butter and cheese trade:

The production of butter and cheese as specialties began in the eastern part of this State scarcely thirty years ago; thence it extended northward and westward, until it has become the leading industry of the State. In Pennsylvania, the best counties are devoted to dairying; the northern part of Ohio makes it a specialty, several counties of Michigan, all of northern Illinois, the best sections of Wisconsin, and portions of Iowa, give almost exclusive attention to making butter and cheese. Colorado has established several cheese factories, and California within ten years has changed from an importing to an exporting State in these articles. Fifteen years ago, Chicago merchants obtained their supplies of cheese from the East; while at the present time one hundred millions of pounds pass through that city for New York annually. Canada within a brief period has become our competitor in the English markets to the extent of 80,000,000 lbs. yearly; while she formerly bought of us. With the exception of the States mentioned and a few counties in Vermont and New Jersey, the remainder of the United States buy more than they produce. The entire South is supplied from this city and the West.

The value of the land and cows in the United States employed in furnishing milk, butter and cheese is not less than $1,300,000,000, or the sum of nearly half the national debt, at its highest point. Over three thousand factories are engaged in the manufacture of these articles and tens of thousands of private dairies besides; more than one quarter of each are in this State. One manufacturer in Western New York State has over forty factories; others in different sections have from five to thirty each. Different firms in this city handle from $2,000,000 to $3,000,000 worth of cheese and butter annually.

The production of cheese is estimated at 350,000,000 lbs. per annum, and of butter about 1,500,000,000 lbs.; of the former 130,000,000 lbs. will be exported this year and about 25,000,000 lbs. of the latter. The value of the two is about $350,000,000, or $50,000,000 more than the wheat crop of the country; three times more than the oats crop; four times more than the potato crop; one seventh more than the hay crop; one third more than the cotton crop, and but one fifth less than the corn crop. The number of cows in the United States is over 13,000,000; which is six times the number in Great Britain, over twice the number in France, two and a half times more than in Prussia, and more than in the countries of England, Ireland, Scotland, Wales, Denmark, Norway, Sweden, Russia, Finland, Austria, Hungary, and Switzerland combined, although these countries together contain four times the population of the United States. The proportion of cows to the inhabitants here is twenty-three to each one hundred persons.

The productions of cheese and butter have increased thirty-three per cent this year, and the exports have been in like proportion.

The cheese and butter exported this year have paid freight to the amount of over $1,000,000 to the ocean commerce of this port, or a sum almost sufficient to support a line of weekly steamers. These articles pay to the railroad companies over $5,000,000 annually for transportation, and the article of milk pays nearly as much more. Loaded on railway cars, ten tons to each car, the butter and cheese produced in this country in one year would fill 22,000 cars, and make a compact line 135 miles long.

Corrections of Errors in Patents.

The following rules have just been promulgated by Gen. Paine, the Commissioner of Patents, which, having received the approval of the Secretary of the Interior, will hereafter govern the action of the Patent Office in such cases as come under their provisions:

Where a mistake incurred through the fault of the Office is clearly disclosed by the records or files of the Office, and does not constitute a legal ground for reissue, a certificate showing the fact and nature of such, signed by the Secretary of the Interior, countersigned by the Commissioner of Patents, and sealed with the seal of the Patent Office, will, at the request of the patentee or his assignee, be indorsed without charge upon the letters patent and recorded in the records of patents.

Where a mistake incurred through the fault of the Office constitutes a sufficient legal ground for reissue, such reissue will be made by the correction of such mistakes only, without charge of office fees, at the request of the patentee.

Mistakes not incurred through the fault of the Office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

No changes or corrections will be made after their delivery to the patentee or the agent, except as above provided.

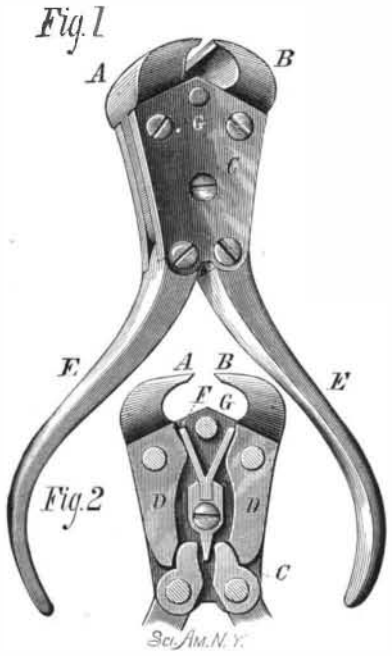
THE FAIRBANKS PRIZES.

Messrs. Fairbanks & Co., the scale makers, are used to winning prizes; yet their experience at the Paris Exhibition must have been a surprise even to them. Seven medals, in as many different classes, constitute a victory as unique as it was honorable. Their honors embrace three gold medals, two of silver, and two of bronze. One gold medal was received for their general exhibit; their scales received one gold, two silver, and one bronze medal; the improved type writer won a gold medal; and the oscillating pumps, for which the company are world agents, received a bronze medal. It is through the skill and integrity of houses like Fairbanks & Co., that the high rank of American manufactures has been achieved; for such products not only compel admiration abroad but rivalry at home. Every article of sterling merit, like the Fairbanks scales, raises a standard in its department of manufacture which all other makers must strive to equal or their success is impossible. The whole country is benefited, both directly and indirectly, by such victories in industrial competition.

NEW CUTTING NIPPERS.

Cutting wire by means of the ordinary cutting pliers is an operation often requiring the entire strength of both hands, making it a difficult matter under some circumstances to use a tool of this description. Any one who has used cutting nippers has seen the necessity of an easier means of doing this kind of work. The accompanying engraving represents a new form of cutting nippers which seem to fulfill the requirements. It was recently patented in this country and in Europe by Mr. Thomas G. Hall, of New York city, and is manufactured by the Interchangeable Tool Company, 71 Broadway, New York.

Fig. 1



HALL'S CUTTING NIPPERS.

In the engraving Fig. 1 is a perspective view, and Fig. 2 has the side removed to show the internal arrangement. The jaws, A B, having cutting edges of the usual form, are pivoted between plates, C, and their arms, D, are engaged by the shorter arms of the handle levers, E; these levers being also pivoted between the plates, C.

A spring, F, engages the two cutting jaws and throws them apart. The screws, which serve as pivots for the jaws and handles, also serve to hold the plates, C, together. A pin, G, acts as a stop on the jaws. By means of the double leverage obtained by this construction, wire cutting is made a very easy operation.

In addition to the great power attained, it possesses the further advantage of not becoming entirely useless from the fracture of jaw or handle. In this nipper a broken jaw or handle can be easily replaced, as all of the parts are perfectly interchangeable, and a new piece may be obtained from the manufacturers at the cost of a few cents. This advantage will be apparent, as all users of such tools well know that other nippers broken in the handle or jaw are useless, and must be replaced by a new tool.

REMEMBER that the information contained in the SCIENTIFIC AMERICAN, on mechanical subjects, new inventions and discoveries, cannot be obtained through any other source.

ANOTHER TRADE MARK DECISION.

The first trade mark case under the recent treaty between the governments of Great Britain and the United States was decided at the Patent Office, December 2.

English trade marks have been registered at Washington for many years under a section of the Revised Statutes, authorizing reciprocal privileges to citizens of countries wherein American citizens were granted the right of registration.

In 1876, Secretary Chandler, at the suggestion of Commissioner Duell, and with the advice of the head of the Department of State, decided that the treaty of 1794 between the United States and Great Britain, under the provisions of which the American patent officials had been registering British trade marks, did not warrant such registry, even before its abrogation, which took place long ago, and that no further privileges of that character could be granted British subjects until a treaty was entered into authorizing it. Thus for more than two years these privileges have been withheld, or, if not, they were granted in violation of the ruling of the head of the department.

Meantime a convention was entered into to meet the exigency, and the resulting treaty, which was framed by Minister Pierrepont and Lord Derby, was promulgated by the President last July. A question immediately arose as to the validity of the British trade symbols registered previous to Mr. Chandler's decision, and that question has remained undecided to this time, when a registration of the mark of George Westenholm & Son, the well known Sheffield cutlery firm, was allowed, thereby recognizing the former insufficiency of all others of its class. The Patent Office officials have determined to make the best of a bad job by registering all such marks without further fees under the heading of office errors.

This decision is thought to affect the interests of some three hundred British subjects whose goods are sold in our markets, though no large interests will be sacrificed if the parties concerned take proper steps to protect themselves.

A Warning to Amateur Chemists.

A recent fatal explosion of an oxygen retort in London calls out the fact that two other accidents of the same nature have occurred within a few years. In both these cases binoxide of manganese was used as the source of the gas, and it was afterwards discovered that the oxide was adulterated, in one instance with soot, in the other with antimony sulphide, making mixtures as dangerous as gunpowder under the conditions required in the manufacture of oxygen. As this compound of manganese is very frequently used in the production of oxygen for experimental purposes, in the class room and elsewhere, it should always be tested beforehand for such adulterations.

Correspondence.

C. E. Andrews & Co.'s Baking Powders.

To the Editors of the Scientific American:

In your issue of the 16th ult., was a communication by Henry A. Mott, Jr., in which our name is used in a manner calculated to mislead the public, by saying that *the* baking powder manufactured by C. E. Andrews & Co., of Milwaukee, Wis., contained ingredients unhealthy and injurious. If the analysis given meant our oldest baking powder, known under the brand of Pearl, and that *it* contained no cream tartar, we now propose: If any chemist in New York, or elsewhere, will select with *us*, wherever sold, a number of one-pound, full-weight cans of *our* Pearl Baking Powder, that we may be confident that the labels have not been broken and the powder tampered with, then we will select a chemist, and the two to select a third, and then upon analysis, if they declare that the analysis then given corresponds with that given in your issue of the 16th ult., under the ambiguous title of "The Baking Powder," and that the Pearl does not contain cream tartar, that biscuits made from it would be injurious, then we are ready to pay upon demand any amount previously agreed upon.

If the result of the analysis made by the chemists so chosen does *not* correspond to the analysis given of "*The* Baking Powder" in yours of the 16th ult., but that the principal ingredient in our Pearl is cream tartar, then the opposite party is to pay us the amount previously agreed upon.

We DO make and sell a baking powder containing exsiccated alum, and if that is *the* baking powder meant in yours of the 16th ult., why was not the name "Regal," which is the only printing matter on the front part of the label, given, as the names of the other powders alleged to have been analyzed were stated? Our alum baking powder we take as much interest in, as in our oldest, the Pearl. When sold it was always stated to be an alum powder, and no misrepresentations made. WE were satisfied that biscuits made from it were in no way injurious. We shall continue to sell it, with the name of the powder, Regal, and our firm name upon the labels, especially after the clear, concise, and intelligent exposition of the harmless effect of exsiccated alum in baking powders, given by Mr. Henry Pemberton, Jr., in your issue of December 7th, and corroborated in same issue by the opinion of such an eminent chemist as R. Ogden Doremus, M. D., LL.D., Bellevue Hospital Medical College, New York.

We take the liberty to quote you, Messrs. Editors, from your issue of December 7th: "Finding alum in the baking powders named, Dr. Mott leads the reader to infer that there must be alum in the biscuits made therewith. This inference, as Mr. Pemberton shows beyond a doubt, is altogether wrong; the chemical process of baking causing the total disappearance of the alum as such, the resulting compounds being either wholesome or inert. . . . . The whole matter, indeed, seems on examination to resolve itself into a rivalry between different *methods* of producing baking powders; and in lauding one form at the expense of another equally wholesome."

In conclusion, if Henry A. Mott, Jr., is actuated solely for the public good, and is republican in his wishes, and not ROYAL in his proclivities, he will admit the truth of your editorial from which we have quoted.

Respectfully,

C. E. ANDREWS & CO.,

Manufacturers of Pure Spices, Pearl and Regal Baking Powders, Milwaukee, Wisconsin.

PERSONS living in cities and large towns can obtain the SCIENTIFIC AMERICAN at the counter of any enterprising newsdealer in their place. It is commendable to patronize your local news agents by subscribing through them.

THE PURITY OF REFINED SUGAR.

BY HENRY A. MOTT, JR., PH.D., E.M.

Having had occasion during the past five years to constantly examine the refined sugars of the market, I can say that in the whole course of my experience I have never examined a sample of sugar to which any intentional foreign substance had been added It is true that in some refined sugars a trace of tin has been detected by acute chemical tests, but the amount present was so infinitesimal that no harm could accrue from the use of such sugars. Professor Chandler, speaking on this point, says, "The quantities of tin employed are too small to give any cause for alarm." The fact that some sugars when used in tea produce a dark color has led some people to believe that the change in the color of the tea was due to some substance used to adulterate the sugar, which, however, is not the case. In preparing the raw sugars from the cane juice it sometimes happens that the juice being acid (not being thoroughly neutralized) takes up a small percentage of iron from the evaporating pans, and strange as it may seem, this small per cent or trace of iron follows the sugar all through the refining process; and it is this small trace of iron which, when brought in contact with the tannin in tea, produces a dark color, which is objectionable for green teas, but in no way injurious; this, however, is only present by the merest chance, not once in a thousand times.

With respect to the addition of glucose to refined sugar—as considerable has been written on this subject—I think it well to say a few words. With the exception of cut-loaf, granulated, and extra powdered sugar all refined sugar contains a small percentage of a sugar known as inverted sugar. This inverted sugar has been falsely represented to be glucose. The truth of the matter is that very few persons appreciate what the word glucose is understood to represent in commerce, hence arises the misstatements regarding it. The word glucose applies to the sugar in commerce known as common starch sugar. In chemistry it still has another name, dextrose. The cause of the importation and increased home production of glucose arises from the fact that most of the lager beer brewers in the country and the manufacturers of other malt liquors are using a large percentage of glucose as a substitute for malt. Glucose also has a large use in the manufacture of candy and honey.

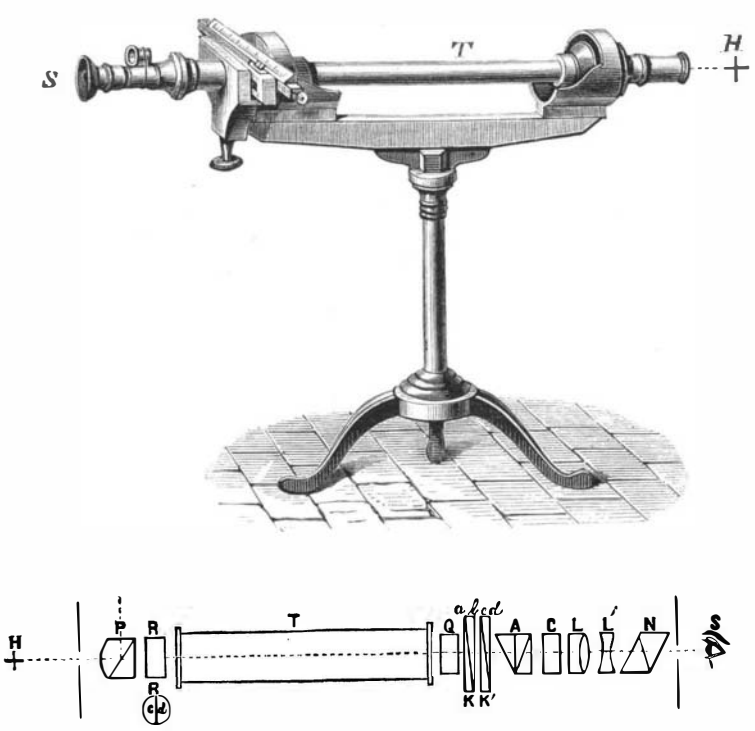
I think the following explanation will clearly demonstrate the impractibility of adding glucose (starch sugar) to cane sugar and still have the latter sugar test less than 100 per cent. Several instruments known as saccharometers are used for determining the per cent of sugar in a given sample. The annexed engraving represents the one known as the Duboscq Saccharometer.

For this instrument it is necessary to weigh 16·035 grammes of the sugar to be tested, to dissolve the same in 100 cubic centimeters of water, decolorizing if necessary, and examine a portion of the solution in the instrument.

With pure granulated cane sugar, taking 16·035 grammes, 100 per cent will be indicated. With pure dry powdered glucose, 194 per cent will be indicated—for convenience, we will say 200 per cent. Therefore one grain of glucose affects light as powerfully as two grains of cane sugar. Now let us apply this fact to an analysis. Given a sugar which has the following composition Cane sugar, 90 per cent; water, 3 per cent; gums, inverted sugar, and mineral matter, 7 per cent; total, 100 per cent.

If the 7 per cent of the above sugar were glucose (which it is not) then, the per cent of cane sugar is too high. For 7 per cent of glucose is equal to about 14 per cent of cane sugar in its effect on light, as shown above. Therefore from 90 per cent we must subtract 14 per cent, leaving only (90 — 14) 76 per cent as the amount of cane sugar present in the sample. This is known to be false, as 90 per cent of sugar can be obtained from a sugar testing 90 per cent. Therefore 7 per cent of glucose cannot be present in the sugar. If, in another case, 7 per cent of glucose were added to the above sample of cane sugar, it would test over 100; but no such reports have been made even from the Custom House chemist; therefore to say that any profitable amount of glucose has been added to any of the samples, the analysis of which has been published as testing under 100 per cent, is simply nonsense. The question may be asked, What is inverted sugar? The answer is simple. If cane sugar be heated in any part of the operation of its production or refining process for a considerable length of time, or in a slightly acid solution, some of the sugar will be converted into inverted sugar; this sugar is present in the unripe cane, which in the ripe cane is transformed into cane sugar, and then in the decay of the sugar cane appears again, as also in the renewed growth of the cane. Inverted sugar is largely present in molasses; not crystallizing itself, it prevents the cane sugar from crystallizing also. Inverted sugar is a compound made up of dextro-glucose and lævulose. Dextro-glucose is the same sugar chemically as dextrose, and effects the light to the right the same as cane sugar. Lævulose is a left handed sugar and effects the light in the opposite direction. The mixture of these two sugars, known as inverted sugar, is also left handed from the fact that the per cent of lævulose which enters its composition is more than sufficient to neutralize the effect of the dextro-glucose on light.

If the 7 per cent in the above analysis were all inverted sugar, then the 90 per cent of cane sugar would be too small, for the 7 per cent would prevent some of the cane sugar manifesting itself to the right, or, in other words, some of the cane sugar would be neutralized; the test of the instrument would in such a case fluctuate with the quantity of inverted sugar present. It may be well to state that inverted sugar does not act as powerfully to the left by two thirds as cane sugar does to the right, therefore the effect would be considerably less. The 7 per cent in the above analysis, as stated, is composed of gums, inverted sugar, and mineral constituents (present in most all foods). The gums act on light, some to the right and some to the left, but sufficiently to the right to neutralize those to the left, as also to neutralize the inverted sugar. Therefore the test of the instrument for cane sugar is correct. From the above it will be clearly seen that if glucose (starch sugar), which acts to the right, were added to cane sugar alone, the sample would in every case test over 100 per cent, but as no such sample has as yet been reported, we must deny that glucose is used to adulterate sugar. Inverted sugar (which, I have stated, contains dextrose), cannot be added as the crystallization of the cane sugar would be prevented. Let us look for a minute at raw sugars, analyses of which I have made by the thousands, and of which I can state (with the exception of sand) I have never met with any adulterated samples. The impurities present in raw sugar, which it is the duty of the refiner to remove, are treacle, caramel, fragments of sugar cane, sporules of a fungus, live animalcula or acari, and albuminous matter, which decomposes and promotes fermentation. It is for these impurities that raw sugars are unfit to use before being refined. The acarus sacchari can be seen by the eye, being itself of sufficient dimensions, and when taken into the system produces a series of disturbances. From the following analysis of raw sugar it will be seen that it contains inverted sugar, which some ignorant writers have tried to pass off as glucose (starch sugar). If raw sugar contains inverted sugar, we certainly would expect in the low grade refined sugars to find it present also, which is the case; thus demonstrating that inverted sugar is naturally present in refined (soft) sugars, and not that it is added.



DUBOSCQ'S SACCHAROMETER.

ANALYSIS OF A RAW SUGAR.

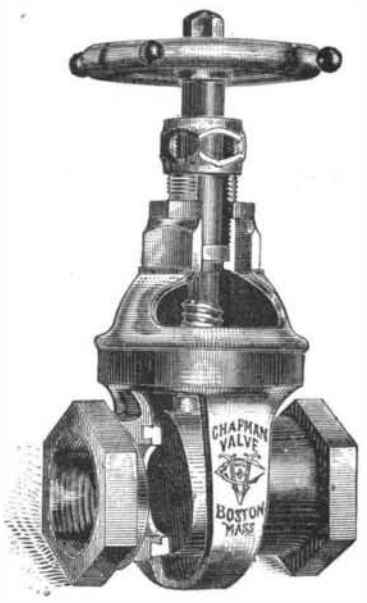
Cane sugar	82·50	per cent.
Water	6·20	" "
Inverted sugar	6·30	" "
Extractive matter, gums, etc.	3.52	" "
Mineral matter	1·48	" "
	100·00	per cent.

There is another point connected with the analyses of refined sugar which have been published, which is very apt to mislead the public, and that is to use the word impurities for all that is neither water nor cane sugar. To a scientific man this word explains itself, but to the public it means everything impure and injurious, such as arsenic, antimony, tin, etc., while it really means inverted sugar, gums, and mineral matter. Until, then, a refined sugar is found that tests over 100 per cent and contains a large amount of tin, the public may indulge in this important article of food with perfect safety.

POUGHKEEPSIE, N. Y., according to the Chicago *Railway Review*, is to have no more locomotive whistling. A bell, worked by electricity, is set up at the depot, and when the trains come within a mile of the station, it will ring until they arrive. The danger signal is thus given, and the waste of steam is avoided, to say nothing of the racket. Any engineer who whistles hereafter when in Poughkeepsie loses his situation on the Hudson River Railroad.

CHAPMAN'S VALVES AND HYDRANTS.

At the recent Massachusetts Mechanics' Exposition in Boston, the Chapman Valve Manufacturing Company had a fine exhibit of their valves and hydrants, to which allusion was made in our notices of the exhibition. The highest award given in their class (a silver medal and diploma) has been awarded this exhibit, coupled with a report from the Board of Managers indorsing the claims made by this company for superiority of their manufactures.



The company construct fire hydrants and direct passage valves of all sizes from one half inch to thirty inches in diameter, for all the various uses to which valves are applied. They are constructed on principles that differ from other valves and hydrants.

The accompanying cut is a sectional representation of one of their steam valves. To all who have been troubled with leaky valves a brief description showing the advantages claimed for the Chapman valves may be interesting. The introduction of a ring or packing of Babbitt metal, or other similar alloy, around the inlet and outlet openings of the valve, forms a seat for the gate when the valve is closed that insures tightness between them. This material will outwear any other known substance used for seats of valves, and will resist the cutting action of steam. Hot or cold water has no injurious action upon it; for gas and ammonia it possesses qualities not found in any metal; while for acids, various alloys may be used adapted to the different kinds of acids that are to pass through the valves. Thus each class of valve has for its seat an alloy which has been found by experience best fitted for the service the valve is to perform. It is stated that all of the seats are non-corrosive, and that as the alloy forming the seats is dissimilar from the metal forming the gate, no cohesion can take place. The alloy is cast into dovetailed recesses in the body of the valve when the gate is in position, and forms a perfect joint with the face of the gate. The body of the valve and seats are made tapering to conform to the taper of the gate. In case of wear or accident to the seats, they may be refaced, a recess being left in the bottom of the valve for the tapering gate to conform to its new seat. In case of destruction of the seats, they may be recast into the valve with slight trouble and expense. The use of alloys of metal for valve seats is secured to this company by letters patent. The gate is made in one piece in the form of a hollow tapering plug, guided upon its sides to prevent it from coming in contact with its seats until the passage is closed, thus avoiding wear of both seats and plug. It is probably well known that the form of gate in direct passage valves in general use is two disks, hanging loosely upon the spindle, variously joined at their backs, and having some expanding form to force the disks in closing to their bearings, when opposite their seats. These valves are called adjustable disk valves, and are fitted with seats of hard metal. The early make of gate valves were constructed with a plug gate, but owing to the cohesion which took place between the gate and its seats of hard metal, it was found impossible to operate them with satisfaction, hence the invention and introduction of adjustable disk valves. The advantages of a plug gate over disks is, that there are no parts, joints, or wedges to get out of order, and that the action of the plug gate in closing is positive in a vertical line, and not by expanding to the seats. It has been reserved for this company to combine the advantages of a plug gate with seats to which the gate would not cohere under any circumstances, irrespective of the length of time they may remain in contact. All valves are tested by hydraulic pressure far above what they will be required to withstand. Special valves of large size are made for oil pipe lines that are tested to a pressure of 2,000 lbs. per square inch. The largest valves open and close easily, the seats and all the working parts being fitted to insure ease of operation.

The fire hydrants manufactured by this company are known as gate hydrants, having a gate valve at their base which opens and closes vertically, gradually cutting off the flow of water and preventing any water hammer or strain upon the pipes and joints in closing. The gate valve is constructed on the same principle as the water gates, and possesses all the merits claimed for them.

Further information may be obtained from the Chapman Valve Manufacturing Co., 77 Kilby street, Boston, Mass.