

THE SELDEN COMPOUND PUMP.

A high degree of expansion combined with a regular and steady velocity of piston has, we are informed, been obtained by Mr. A. Carr, of this city, by the compounding of his Selden pump. This pump, in its original form, consists of a steam and water cylinder, set in a direct line and connected rigidly by a center piece, the rod passing directly from the steam piston to the water piston, and being rigidly fastened to both. We give in the annexed engravings a perspective view of Fig. 1, and a sectional view of Fig. 2, showing the machine as compounded.

The larger or secondary cylinder, M, of the compound engine is provided with a piston, N, the rod of which passes

moving the valve, S; and by shifting the valve, the exhaust from the primary engine will pass from 9 through the port, 15, and pipe to the exhaust, R, and the steam from the boiler will go to the secondary cylinder by the port, 10, so that the secondary cylinder may be operated by the boiler steam or else by the exhaust steam from the primary cylinder, as occasion may require.

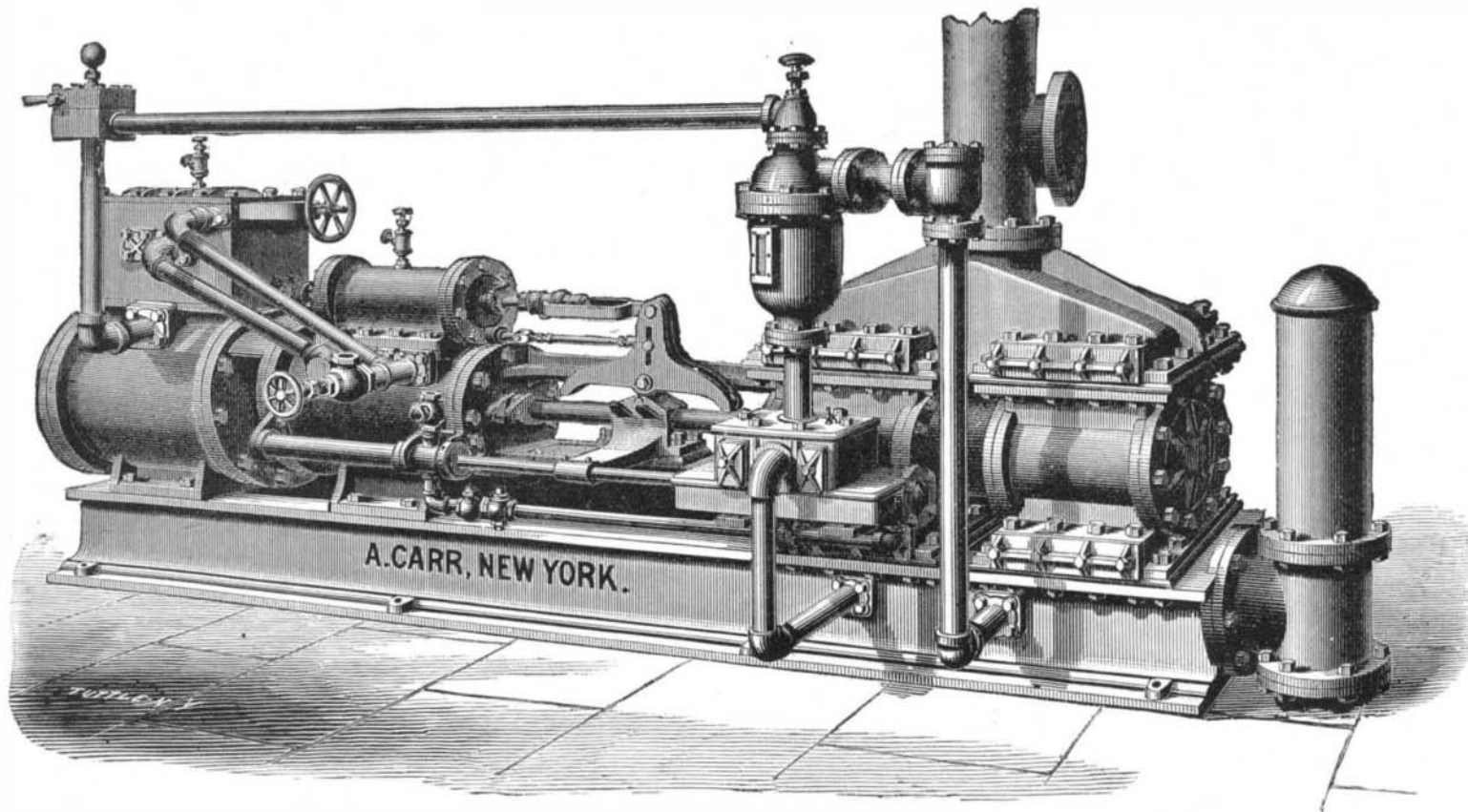
Dangerous Toys.

The past few weeks have been a harvest season for dealers in toys, candies, and all sorts of trifles, especially those intended for Christmas gifts to the dear children. Happy the family who have not suffered from the diabolical schemes of

covered with an incrustation, probably acetate of zinc, first directed Tollen's attention to this subject. He made an analysis of the doll and found that it contained not less than 60.58 per cent of oxide of zinc. Some lime, oxide of iron, and phosphoric acid were detected in the ash. Another doll, purchased in Brunswick, and especially recommended as "harmless," gave 57.68 per cent of ash, which consisted of oxide of zinc with traces of impurities—lead, iron, lime, and sand.

Ant Intelligence.

Sir John Lubbock has recently delivered a lecture on ants, which is replete with curious and interesting information,



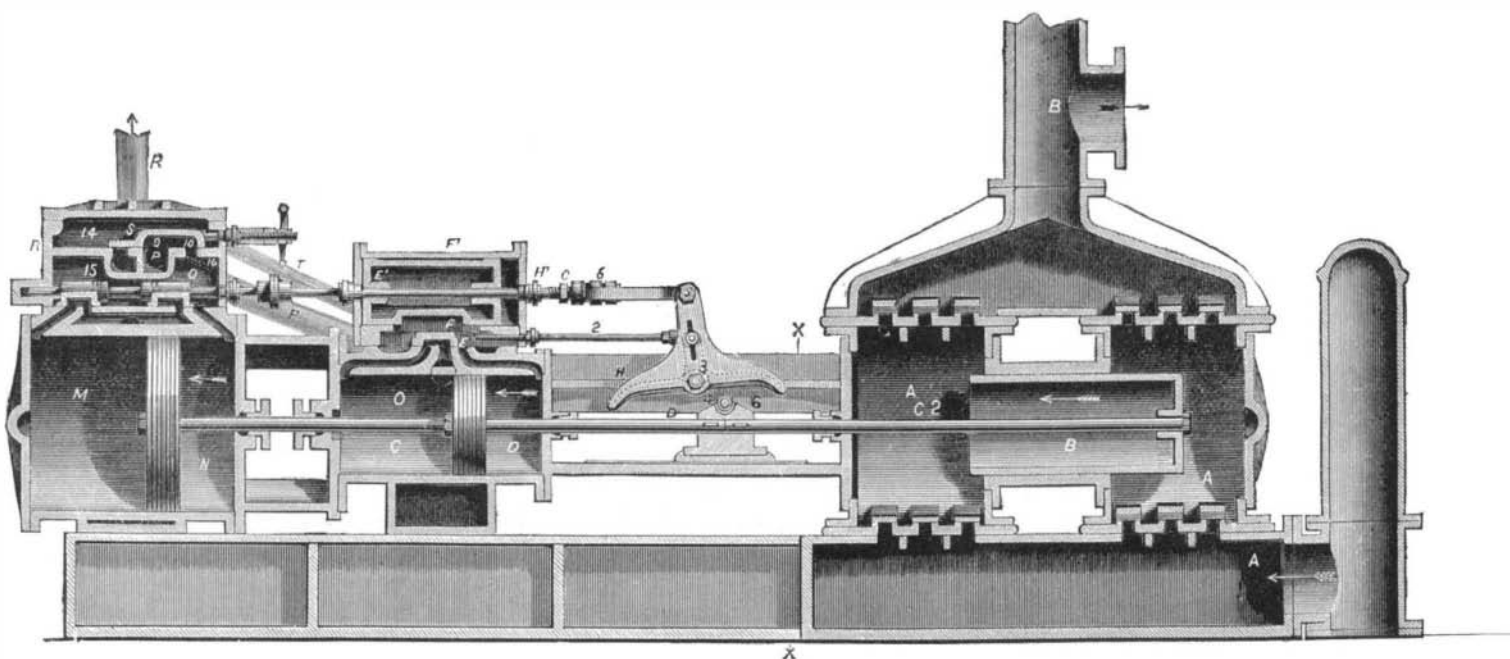
THE IMPROVED SELDEN PUMP.—Fig. 1.

to the piston, D, of the high-pressure cylinder, so that the two pistons move together, one in aid of the other, and both exerting their power upon the piston rods. This feature of a compound engine is not new, save in its combination with a direct acting pump, by connecting the valve, O, of the secondary cylinder with the valve-moving piston, E, of the primary engine, so that the steam acting upon this piston moves the valves of both engines simultaneously to open and close the respective ports. Ordinarily the exhaust steam from the primary engine passes by the pipe, P, to the valve chest of the secondary engine, and the exhaust steam from the secondary cylinder passes by the pipe, R, to the condenser.

the rapacious manufacturers. We do not refer to the little victims who paid the usual penalty for consuming candy and nuts in intemperate quantities. Unfortunately there are manufacturers who delight in introducing copper, lead, arsenic, and other deadly poisons into the nursery and kindergarten. So much has already been said and written in regard to Paris green that most intelligent and reading parents avoid presenting their little ones with green-colored picture books, or toys painted that color. We are sorry to say that other colors are frequently poisonous, and it is hardly safe to place any painted toy in the hands of a child that is liable to suck it or kiss it, as the little ones often do.

There is another class of articles, which have always been

the result of his own examination of some thirty nests of over twenty formic species, which he keeps under constant supervision. Sir John has not acquired a very high idea of the much-vaunted intelligence of the ant. He says that, when he cut off their food supply by drawing back a little strip of paper which had acted as a bridge, they had not intelligence to rebridge the chasm of one third of an inch by pushing the strip of paper back. Varied experiments of a similar character resulted in the same way, except where a hole leading into a box containing food was stopped by a little mould; then the ants speedily burrowed into the mould, and found their way into the box and again carried off the food. Sir John did not find that display of in-



THE IMPROVED SELDEN PUMP.—Fig. 2.

In order to arrange this engine so that the secondary engine may be partially or entirely supplied by live steam from the boiler, as occasion may require, the exhaust steam is led through the ports 9 and 10 in the divided steam chest, R', and through the D slide valve, S, that is placed over these ports, and said valve is operated by a handle, 12, or other means. The face, 14, of this valve, S, is wide enough to cover the secondary exhaust port, 15, when the face, 16, of the valve is over the port, 10. This face is narrow, so that the exhaust steam can pass through the port, 10, at one side of such face, 16, and the live steam will pass by the pipe, T', in at the other side.

The relative widths of these openings can be varied by

regarded as particularly safe and unobjectionable, but which have proven quite as dangerous as many other toys, namely, those made of india rubber. In a recent number of the *Deutsche Industrie Zeitung*, in regard to the use of oxide of zinc in india rubber, it is stated that the use of such rubber tubes and stoppers for nursing bottles was proven so injurious to health that the agitation against it abroad has had the effect of driving it from the market. B. Tollens, of Göttingen, has, however, found that most of the toys, dolls, animals, etc., are still made of rubber with oxide of zinc in it. A case where a child was taken sick after playing with an india rubber doll, and putting it in the mouth frequently, and where the doll, on being thrown into vinegar, became

telligence and affection which some naturalists have declared induce ants, when any of their companions are accidentally buried, to burrow down and rescue them. They do seem capable of discriminating between companions and strangers; for when a number of each were intoxicated and placed near a nest, the sober ants, after being very much puzzled at the unaccountable condition of the inebriates, carried into the nest their helpless friends and pitched the strangers into a dish of water. When, however, some friends and strangers were chloroformed to death and laid near a nest, the ants seemed to appreciate that the deceased were past remedy, and therefore pitched both friends and strangers indiscriminately over the edge of the table. Attempting to verify the

truth of Huber's declaration that, when ants had been separated for four months and then returned to their nest, they were recognized and caressed by their companions, Sir John found that, though there was no sign of recognition when a separated friend was returned to the nest, he was never attacked, while a stranger being put in was always driven out or even killed. As regards the senses of ants, though Sir John believes they hear, yet they take no notice of any sound he could make; and though they undoubtedly see, they cannot have very keen sight. His experiments do not confirm the suggestion that ants are able to communicate to their companions where food has been discovered; for when single ants had been placed on food, and, going back with some to the nest, were returning with companions to the store, in every case where these pioneer ants were captured their companions wandered about helpless and failed to find their way to the spot.

A NORWEGIAN TIMBER CHURCH.

There exists in Norway, says the *Building News*, a series of wooden churches of great interest to the antiquary. The subject of our engraving is, perhaps, the most curious of them all. Situated in the neighborhood of some of the wildest and most romantic scenery in the country, it is of strange and fantastic design, and the carved pinnacles at its angles give it the appearance of a Chinese pagoda rather than a Christian church. The building is entirely of pine, the roof and walls being covered with tooth-shaped shingles, protected from the weather by layers of pitch. It possesses nave, chancel, and apse, the roof of the latter forming a most curious feature—resembling a large beehive. A covered way, about 3 feet wide, runs all round the church. It is believed to have been erected in the 11th or 12th century, and the resemblance which the mouldings and capitals bear to English architecture of that date fully bears this out.

The Lesson of a Life.

In December, 1845, in the Department of the Vosges, Xavier Thiriat, a boy of ten, accompanied four young girls of about the same age to the church. They had to cross a brook, over which was placed a single loose plank. The boy crossed safely, the first girl who attempted it fell in. The boy jumped in, pulled her out, and then, walking in the water, guided each of the girls across. Some time was lost by this, and the party reached the church late. Xavier, ashamed of being late, did not go up to the stove, but kept behind. He reached home chilled, a dangerous disease followed, by which he was left a complete cripple for life; his only mode of moving about was on hands and knees, so completely were his legs paralyzed and distorted. Coming of very poor people, there was every prospect that Thiriat would be a heavy charge to his family and a wretched burden to himself. Instead of this, he reached manhood bright, cheerful, and intelligent. Reading all the books which he could lay hold of, he was soon the best educated man in his district, and rapidly acquired extensive influence, which was always used for good. He induced the young people to read and to study. Some contributions to the local newspaper, the *Echo des Vosges*, attracted attention and made him known, the result of which was that further intellectual opportunities were extended to him. He made himself a good botanist, meteorologist, and geologist, instructed others in these branches, and procured the foundation of several local libraries. He could not, however, be satisfied without achieving his complete independence and earning his support. He obtained the position of manager of the telegraph at a neighboring town, was made secretary to the mayor, became a favorite correspondent of several agricultural papers, and received the highest reward of the French Franklin Society—its gold medal.

All this was accomplished by native force of character and strong religious feeling, under circumstances not merely adverse, but at first absolutely hopeless. A horrible deformity, intense suffering, absence of instruction, crushing poverty—all these disabilities were overcome unaided, and this ignorant and crippled lad made himself the light, intellectual and moral, of his whole district.—*Public Ledger*.

Sumac.

Sumac (called by botanists *rhus coriaria*), owing to the large quantity of tannic acid which it contains, is extensively employed in dyeing, tanning, in the manufacture of writing inks, etc. Thousands of tons of the dried and powdered leaves and stems of this shrub are annually consumed in the arts. It comes into market in the form of a fine yellowish powder, its chief source being the island of Sicily, where it is extensively cultivated. Its present market value

in New York is: Fine Sicilian powder, \$120 per ton; Virginia, \$65 per ton. The poorer qualities sell for from \$50 to \$60 per ton. Various attempts have been made to reduce the great expense attending the transportation of the crude sumac for market by extracting the tannin directly upon the ground where the material is harvested, and sending the extract into market in a concentrated form; but it has been found that such extract cannot be kept for any length of time, as it is liable to a species of fermentation which converts the major part of the tannin into gallic acid, and greatly impairs its marketable value.

Diamond Cutting by Girls.

This is another new trade for women, and we wonder that those who are seeking new outlets for feminine work have not thought of it long ago. Diamond cutting is the mechanical labor which above all others requires that extreme delicacy of touch and nice perception of form, color, etc., which is inborn in the majority of women, but which nearly all men are compelled to use much practice to acquire. Diamond cutting involves no severe physical labor, except possibly in the grinding of the stones together to form the facets. That branch, requiring powerful wrist muscles, may be left to the men; but every other process, from the splitting of the rough gems up to the final polishing, is fully within feminine capabilities.

Twenty-three young women are now successfully working at this trade in Roxbury, Mass. and the credit of teaching

open to all the world. The shipment of butter in vessels provided with refrigerator rooms, such as are already used for conveying beef to Europe, was suggested; and the growing trade in spurious butter under various pretentious names was discussed and condemned. Many of the members present urged that legislation should put a stop to the sale of these compounds as butter. Legislation cannot stop the manufacture of any article not proved to be pernicious to the public; but it might properly compel the seller to designate, on his package, of what the contents consist, so that the purchaser may not be deceived.

The Manufacture of Ammonia Salts from the Ammoniacal Gas Liquor.

The following method of preparing ammonia salts from the gas house waters, by means of soda salts, is particularly interesting, since it produces a pure carbonate of soda at the same time, and is both cheaper and easier than the Solvay soda process; and it involves no waste products. Dr. G. T. Gerlach, of Kalk, near Deutz, is the inventor of the process.

If sal ammoniac is the salt we wish to obtain, chloride of sodium (table salt) is of course the source of the chlorine, and the process resembles in some respects that of Solvay. The crude ammoniacal liquors are first distilled and yield carbonate of ammonia: in this is dissolved a quantity of common salt, equivalent to that of the carbonate of ammonia present. This solution has a gravity of 1.22. Into it is passed a current of carbonic acid gas, as long as any bicarbonate of soda is precipitated. Some sulphuretted hydrogen is thus expelled, which had passed over in the form of sulphide of ammonia. The precipitated bicarbonate of soda is removed and dried; and on heating, enough carbonic acid is expelled to serve for the next operation, monocarbonate of soda remaining. The liquid contains chloride of ammonia with some undecomposed carbonate of ammonia, with chloride of sodium and a little dissolved bicarbonate of soda. The carbonate of ammonia is recovered by distillation, the sal ammoniac and salt by crystallization after concentration. Instead of being decomposed by lime, as in Solvay's process, the sal ammoniac is sent to the market. If, however, it is desired to make *agua ammoniac*, some of this mother liquor is treated with lime and distilled.

If sulphate of ammonia is the product desired, the sulphate of soda is employed to decompose the carbonate of ammonia. Either crystallized Glauber salt is dissolved in the concentrated solution of carbonate of ammonia, or the anhydrous sulphate (salt cake), obtained in the manufacture of nitric or hydrochloric acid, is dissolved in a less concentrated solution of the ammonia salt. Equivalent proportions of the salts are employed, and the solution has a specific gravity of 1.3. Carbonic acid is passed into this solution until the bicarbonate of soda ceases to be precipitated. The latter salt is removed and dried as before. In solution are sulphate of ammonia, undecomposed carbonate of ammonia and sulphate of soda, with a

trace of dissolved bicarbonate of soda. The carbonate of ammonia is recovered by distillation, the other salts by concentration and crystallization. When nitrate of ammonia is the product required, the carbonate of ammonia is decomposed by means of Chili salt-petre, or nitrate of soda. The reactions are the same as before, the chief products being nitrate of ammonia and bicarbonate of soda. It is evident that the use of chloride, sulphate, and nitrate of soda, instead of the corresponding acids, must be both cheaper and more convenient, while the simultaneous production of soda ash still further increases the profits. The separation of the salts which remain in solution is an easy matter, owing to their unequal solubility. In the first case we had common salt and sal ammoniac; on concentrating to a certain point the former will crystallize out of the boiling solution, and after this is removed the solution is allowed to cool, when the latter will crystallize out. Sulphates of ammonia and soda crystallize from solution as a double salt containing two equivalents of water of crystallization. But on evaporating a solution of these salts to a certain point, the anhydrous Glauber salt will separate, and sulphate of ammonia will remain in solution. The anhydrous Glauber salt is not pure, and is employed for decomposing a fresh quantity of carbonate of ammonia. In separating table salt and Glauber salts at a boiling heat, care must be taken not to burn the salts, and on a large scale steam heat should be employed.

A good waterproof cement may be made by mixing glue 5, rosin 4, red ochre 2 parts, with a little water.

The Dairy Interests of the United States.

The fourth annual convention of the National Butter and Egg Association was recently held at Chicago, Ill., and was very largely attended. The President, Mr. George E. Gooch, of Chicago, spoke of the benefit which the trade derived from such meetings, and of the magnitude of the interest, adding that \$6,000,000 worth of butter was sent eastward from Chicago during the past year. The butter and cheese produced in this country last year reached a value of \$124,000,000, and the milk sold in addition was 325,000,000 gallons. He also called attention to the prizes, value \$1,500 gold, to be given for the best exhibits of butter and cheese by the Royal Agricultural Society of England, at their meeting to be held in Liverpool next July, the competition being



ANCIENT TIMBER CHURCH IN NORWAY.