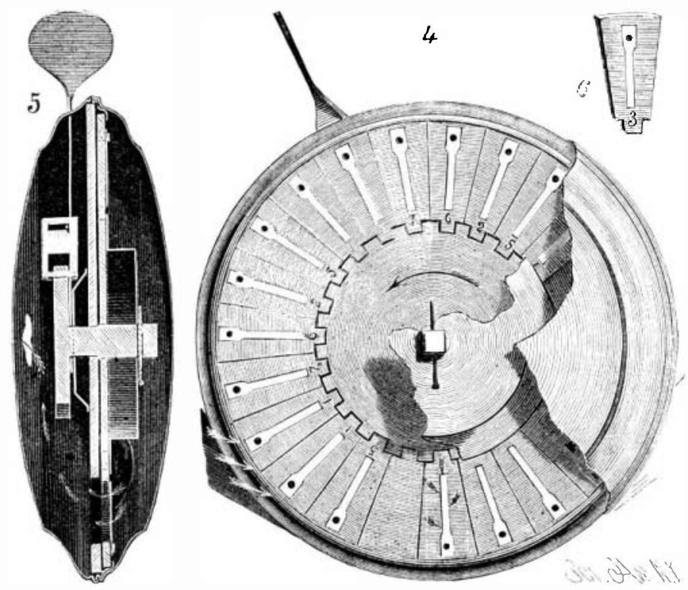
The Chicago New Drainage Canal.

August saw the actual beginning of one of the largest engineering schemes in the country. For many years Chicago has had spasmodic attacks of realizing that her sewerage system was inadequate to her needs. After each fresh attack improvements have been planned and executed, which, however, were only of a temporary nature, owing to the ever-increasing size of the city. At present, with every severe storm the sewers are flushed out into the river, and with any heavy fall of rain a few miles back in the country the low river valleys are flooded and the waters come rushing down into the South Branch of the river, driving all its dangerous pollution into Lake Michigan. Pumping works have from time to time been established to induce the beautiful Chicago River to change its nature, and, unlike most rivers, be able to flow two ways. These pumps are no longer powerful enough, and for the last five years there has existed a drainage commission whose history is more stormy than that of the Guelphs and Ghibellines, but which has now either killed off its most belligerent members, has lost its fighting blood, or at least appears to be devoting itself in a somewhat more energetic manner to drainage and less to lively discussions of a somewhat political character. The present scheme is to create a channel from Lake Michigan, at Chicago, for a distance of forty miles to Joliet. The route of this channel will lie chiefly through the valley of the Des Plaines. Starting from one of the southwest "tributaries" of the Chicago River, it will, in its westward course, utilize the Illinois and Michigan canal, create new cuts, and finally settle itself into the bed of the Des Plaines, widened and deepened to suit its needs. In time the current will reach the Illinois River, and by this waterway will eventually gain and mingle with the floods of the Mississippi. The one saving feature of the scheme for the counties adjacent to Cook County, and in fact for part of that same county itself, lies in the fact that the land surrounding the lake is considerably higher than that several miles back in the country, and consequently sufficient fall can be secured in the channel to obtain for it a large volume of water from Lake Michigan. That the towns along the route of this channel, into which Chicago intends to pour all of her liquid and semi-liquid filth, should have for an hour entertained the idea of permitting such an enterprise seems incomprehensible. Such, however, in the main is the idea of the present great drainage undertaking of Chicago. There is talk of eventually constructing the channel so as to make it navigable for large vessels, thus making Chicago, as well as the smaller towns along its course, in a degree, seaports, giving them direct connection with the Atlantic.

The law requires that the channel must be two hundred feet wide at the surface, one hundred and eighty feet wide at the bottom, with a depth of water of eighteen feet. The flow of water must be at the minimum rate of three miles an hour. These conditions are required, not because of any question of navigation, but that the sewerage may be sufficiently diluted to render it harmless and inoffensive. Experience and experiments in various countries have shown that twenty thousand cubic feet of water a minute is the least amount that, by diluting, can render harmless the sewage from a city of one hundred thousand population. The plans will contemplate the possibility of the growth of the city during the next thirty years up to the number of three millions in population; and, consequently, the channel will provide for a possible flow of six hundred thousand feet, or three times the original estimate. Not all the water sufficient to dilute the sewage can be carried through the South Branch, and another channel from the lake will have to be created, to enter the main channel at a point farther west. As consent to carry the drainage canal through the west-lying towns has been obtained from the inhabitants, conditional upon the amount of pure water brought into the channel, and this permission would be canceled if any lack of the fresh water supply arises, it appears probable that the requirements will be fulfilled. Though this sketch of the plan contains the chief elements embodied in the scheme, there are many minor details yet to be arranged. The ceremony of breaking ground for the main channel has already taken place, accompanied by the usual amount of flourish. When this great undertaking is finally completed, Chicago will have a system of drainage to be proud of, with a lake unpolluted by the drainage of a great city. The result will be most important, not only to the sanitary condition of the city, but will be the means of adding not a little to its beauty, so far as its water surroundings are concerned.—*Amer. Architect.*

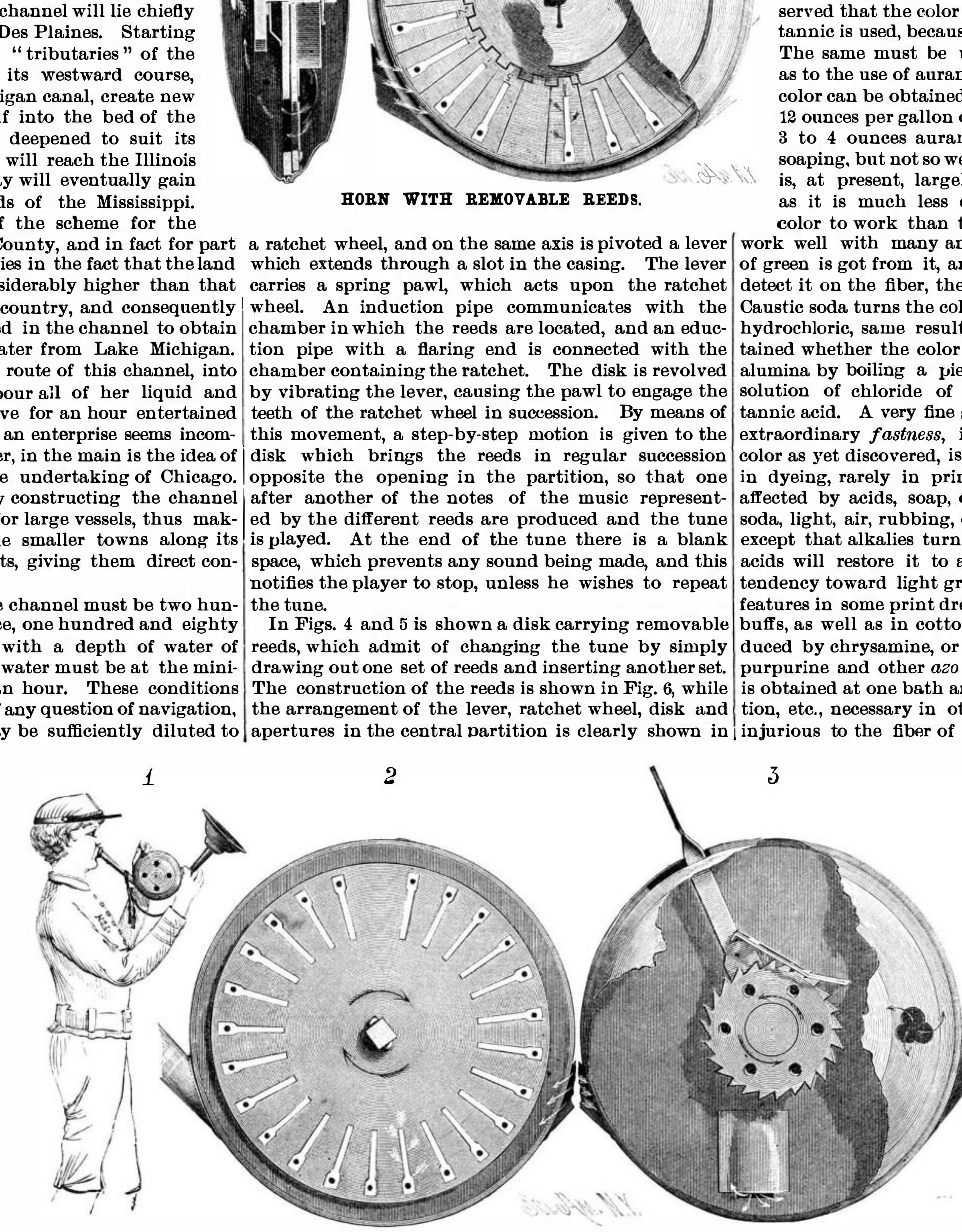
AN INTERESTING TOY.

We give engravings of a toy bugle provided with an air chamber divided into two compartments, in one of which is placed a disk having a series of radial slots covered by reeds. In the partition is an aperture through which air passing through the reeds can find its way into the rear chamber. In this chamber, on the prolongation of the axis of the reed disk, is placed a ratchet wheel, and on the same axis is pivoted a lever which extends through a slot in the casing. The lever carries a spring pawl, which acts upon the ratchet wheel. An induction pipe communicates with the chamber in which the reeds are located, and an eduction pipe with a flaring end is connected with the chamber containing the ratchet. The disk is revolved by vibrating the lever, causing the pawl to engage the teeth of the ratchet wheel in succession. By means of this movement, a step-by-step motion is given to the disk which brings the reeds in regular succession opposite the opening in the partition, so that one after another of the notes of the music represented by the different reeds are produced and the tune is played. At the end of the tune there is a blank space, which prevents any sound being made, and this notifies the player to stop, unless he wishes to repeat the tune.



HORN WITH REMOVABLE REEDS.

In Figs. 4 and 5 is shown a disk carrying removable reeds, which admit of changing the tune by simply drawing out one set of reeds and inserting another set. The construction of the reeds is shown in Fig. 6, while the arrangement of the lever, ratchet wheel, disk and apertures in the central partition is clearly shown in Fig. 4. A person who is not a musician may play upon this instrument as well as the best player.



DETAILS OF THE MUSICAL HORN.

Cotton Manufacture.

Arsenic in Prints.—A large proportion of prints contains small quantities of arsenic—so small, in fact, that there is not the slightest cause for alarm. Many of the anilines, such as ceruleine blue, aniline greens, etc., and many of the vegetable colors, are fixed on calico by printing the color with a salt of alumina and a solution of white arsenic in glycerine, or in a borax solution. The reaction that takes place on steaming the goods is a double compound of arsenic, alumina, and coloring matter or, briefly, double arseniate of alumina and dye. This compound constitutes the insoluble *lake* which colors the fibers of the cloth with a more or less *insoluble* and fast color. This at once removes any danger in the wearing of the material. As a matter of fact, arsenic colors contain a considerable excess of alumina, and this is a *preventive* against the possible presence of uncombined arsenic. In extract alizarine colors, the soluble arseniate of alumina is sometimes added to brighten the colors, but, on steaming, the insoluble compound is obtained. When used properly, there is no harm in the use of this drug, and the cry which, no doubt, has been the cause of a decline in some classes of prints has originated from experiments on a small scale and conducted on false premises.

Colors.—Auramine is a coloring matter which gives a very pure shade of yellow, whether dyed on yarn or printed on calico; for yarn, chrome yellow is, however, cheaper and more readily produced. Auramine has all the advantages of aniline yellows without their deficiencies, as it is moderately fast to soap and light. If dyed by means of alumina, a good green shade is obtained, but it is loose; when fixed with sumac and tin, or tannic acid and tartar fustic, a most beautiful shade of pure maize yellow is obtained. The more tannic acid employed—up to the limit of 12 ounces good tannic acid to 3 ounces auramine—the faster will be the yellow obtained, but it must be observed that the color is not so bright as when less tannic is used, because the brown dulls the yellow. The same must be understood with equal force as to the use of auramine in printing, where a fine color can be obtained by fixing the auramine with 12 ounces per gallon of pure tannic acid and from 3 to 4 ounces auramine; this will stand strong soaping, but not so well as *berry yellow.* Auramine is, at present, largely adopted in many styles, as it is much less difficult and a more regular color to work than the berry yellow, and it will work well with many aniline colors. A yellow shade of green is got from it, and aniline crystal green. To detect it on the fiber, the following tests are reliable: Caustic soda turns the color white very rapidly; dilute hydrochloric, same result. It can be readily ascertained whether the color is fixed with tannic acid or alumina by boiling a piece of the cloth in a dilute solution of chloride of iron. Blackness will show tannic acid. A very fine shade of yellow, possessed of extraordinary *fastness*, in fact, the fastest artificial color as yet discovered, is chrysamine, used very much in dyeing, rarely in printing. It is not materially affected by acids, soap, or alkalies, and even caustic soda, light, air, rubbing, or chemic have little effect, except that alkalies turn it to an orange shade, while acids will restore it to a pure yellow, with a slight tendency toward light green. The present prevailing features in some print dress goods of pale yellows and buffs, as well as in cotton hosiery and laces, are produced by chrysamine, or mixtures of it, with benzopurpurine and other *azo* colors. In dyeing, the shade is obtained at one bath and without a mordant operation, etc., necessary in other dyes, and which are so injurious to the fiber of fine cotton lace goods. The reason the use of this dye is so much restricted is that a deep shade of yellow cannot be obtained so far. It is, however, found useful for buffs, and every delicate shade of pale yellow, salmon, etc.; it is not readily soluble in cold water, but dissolves freely in hot, and is still more soluble when in boiling water with a small atom of caustic soda. There is little doubt that this is the yellow of the future, when science unfolds nature's mystery.

Metallic Tungsten.

Dr. Martin Krieg, of Magdeburg, prepares pure metallic tungsten in the following manner: The finely ground tungsten mineral is made into a porous mass with fine carbon and tar or pitch. This mass is placed in the voltaic arc of the Jablochkoff system and chlorine introduced through the hollow candles. The candles can be made to furnish the chlorine by adding chloride of lime and silica to the material from which they are made. In either case chloride of tungsten is produced together with chloride of other metals.

If these chlorides be boiled in concentrated hydrochloric acid, oxide of tungsten is thrown down; the other chlorides are dissolved. The oxide is separated by decantation and washed. This oxide, mixed with carbon, can be easily reduced in the voltaic arc in an atmosphere of neutral gas.