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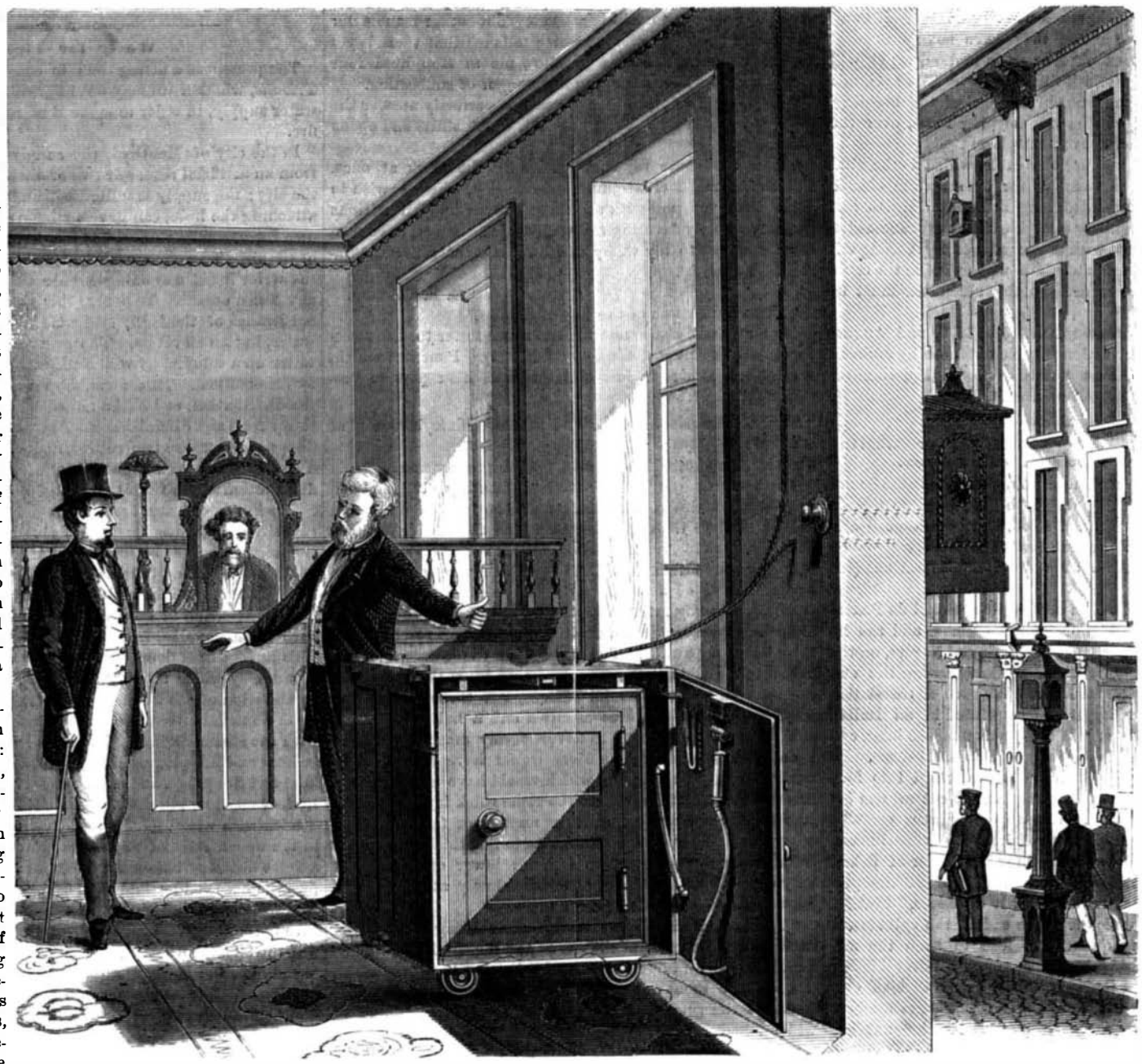
Electro-Pneumatic Protector.

We illustrate, in the accompanying engraving, a very unique invention, which, so far as we can at present see, appears to afford absolute protection to safes or vaults to which it is applied; and it does this without necessitating great strength in the walls of such safes or vaults, and the consequent expense attending their construction.

It has been shown that burglars have been able to keep pace with the inventions, that have sought to defeat them by sheer strength of brute material, except where a large expense is incurred to so pile plate upon plate, and to temper and harden, till the time necessary to penetrate these combined obstacles is greater than that through which safes or vaults are generally left, unprotected by the proximity of honest people.



DUNCAN & ROWELL'S ELECTRO-PNEUMATIC PROTECTOR FOR SAFES AND VAULTS.

So confident are the inventors that the method of protection about to be described is absolutely certain to sound such an alarm, in case of attack, as would at once summon assistance, that they invite the closest investigation, and challenge the severest trial of their claims, especially by scientific electricians, as the gist of the invention consists in a most ingenious application of electricity to sound an alarm when the safe is tampered with, in the slightest degree, with a view to enter it.

The general principle of its action may be stated thus:

The protector, when closed, completes a battery circuit, which is broken by either opening the door or penetrating the walls to a depth equal to that of a single plate of tin. The breaking of the circuit releases the armatures of electromagnets, which, in their movement away from the magnets that previously held them, unlock a train of clockwork placed in a position inaccessible to burglars, and in itself burglar proof, so far as iron and steel casing can make it. This clockwork, once set in motion, sounds an alarm for at least one hour, and can only be stopped by a person who knows the combination upon which it is set, this being in principle like the standard combination locks now generally used on bankers' safes and vaults.

The clockwork magnets are connected with that portion of the apparatus that surrounds the safe, by a peculiarly constructed cable, the junctions being arranged in a manner to be hereinafter described.

Around the safe to be protected is placed a double walled sheet metal case, the space between the walls being filled with corrugated wood to give the case rigidity. The door of the case is made in the same manner; but its interior space is connected with the air space of the rest of the case by means of a flexible rubber tube.

In the center of the top of the protector case, and on its inner wall, is a collapsible disk, which, when uncollapsed, springs toward the inclosed safe, and breaks all the circuits by moving against the end of an insulated pin, as hereinafter described.

The disk is collapsed by exhausting the air, from the connected air spaces in the protector case, through the agency of a small air pump, connected by a flexible tube with the air space in the door. This pump is shown, suspended on suitable supports on the inside of the door where it is hung when not in use, in our engraving. A mercury gage is also shown on the door, which indicates at all times whether the exhaustion is complete or not.

On the inside of the door, in any convenient position, is permanently attached a wedge of copper. This wedge is shown at the middle of the top of the door in our engraving. When the door is closed, this wedge is forced in between the ends of two strips of copper, establishing an electric circuit between the protector case and the alarm apparatus, which is shown in our engraving, attached to the front of the building in which the safe is placed.

The ends of the copper strips, opposite the wedge on the door, are connected, one with the wires of a galvanic battery, and the other with the wires comprising the wires of the cable, which connects the protector case and the alarm. The upper copper strip, nearest the collapsing disk, is made of two pieces, the end of one piece lapping on to the other directly opposite the central part of the disk. The two pieces are so sprung together that they will remain in contact when left undisturbed.

Now the moment the outer shell of the protector case is tapped, the collapsible disk, being relieved from the external pressure of the air, springs into its original position, and, coming in contact with the insulated pin (above referred to, and which is affixed to the inner movable piece of the upper copper strip leading from the wedge in the door to the disk), separates the ends of the pieces and breaks the circuit.

The cable is composed of six wires perfectly insulated from each other. Three of said six wires are firmly twisted together to form the core or center of said cable; and the other three are braided firmly together and wound around said core, and form the outside of the cable. Any attempt to untwist the outside wires necessarily involves the twisting of the inside ones still harder, and, if any considerable force is exerted, will rupture one or more of the inside wires, and of course break the electric circuit.

There are three pairs of electromagnets used in the alarm mechanism, and three distinct electric circuits flow through the cable. To the first magnet the current passes through one of the outside wires, and returns through one of the central wires. To the second magnet, it passes through a central wire and returns through an outside one. To the third magnet, the other outside wire conducts the current, which returns through the remaining central wire. The severing of any one of the wires of the cable will relieve the armature on one of the magnets and instantly spring the alarm as effectually as if the whole six wires of the cable were cut.

As a closed circuit is employed, it is necessary to separate the negative from the positive wires of the cable, and to connect the three negative wires of the cable to the negative pole of the battery, and the positive wires of the cable to the positive pole. There are two outside wires and one central wire that belong together, and which must be connected to one pole of the battery, and one outside wire and two central wires that work together and must be connected with the other pole of the battery. If any person should attempt to attach a second battery to any part of the cable for the purpose of keeping the magnets charged, it would first be necessary to separate the positive from the negative wires in the cable, get at the central wires and test them, and also test the outside wires, to ascertain which are negative and which are positive, before attaching the second battery and before venturing to sever any one of the wires of which the cable is composed. Now to get at these wires so as to test them is deemed an impossibility, as the method of twisting is such that no wire can be traced.

From this it will be seen that the electric current, generated in the battery, passes through the battery wire to one of the strips of copper: then—when the door is shut and the air space exhausted—through the wedge of copper on the door to the other copper strip, and through that to the lap joint above described, and, passing that joint, enters the cable and flows through the helices of the magnets It is obvious that if the door be opened the electric current must be broken by the withdrawal of the copper wedge, and the alarm instantly sounded. So, also, if the copper strips are separated at their lapped joint, as they certainly must be by the pressure of the disk whenever air is let into any of the air spaces of the case, the elecrical circuit will be instantly broken and the alarm sounded.

It is claimed that the cost of battery power will not exceed three cents per day. The battery requires attention only once a week, such adjustment occupying less than five minutes' time, and it is intended to ultimately use a battery that will run for a year or more without any attention. The battery can be placed in any position where most convenient. There are no fumes or odors arising from it, and it is harmless and inoffensive. It can be kept in order by a servant, a galvanometer indicating whether it has received proper care.

To use the "Protector" requires no knowledge of electricity. It is only necessary to learn to operate a combination lock attached to the alarm box. This alarm consists of two double bells, struck two thousand times per minute, and a large gong bell, struck once in twenty seconds. When started it will

run for an hour or more. The alarm is placed in a strong iron or steel box, and set into or bolted upon the outside wall of the building, over the sidewalk, in plain view and hearing of the police and others in the street. The box, from its construction, strength, and position, is believed to be burglar proof. It cannot be reached without a ladder, nor worked upon without lights. Any one attempting to get at the alarm would be discovered.

The alarm box can be placed outside, on either story of the building, or in any room of the building, or at any point, however distant away from the building. Two or more alarms can be used when deemed necessary. One is shown in our engraving, supported on an iron post, placed at the outer edge of the sidewalk.

The alarm is easily and securely controlled by the knob of the combination lock inside of the room, and does not require over one minute per day to shut it off and on. The alarm once started cannot be stopped by any one, except the person knowing the combination of the lock. Any attempt to remove it from its position would break the circuit and set it going, when it would run in any position, and could not be stopped by any one ignorant of the combination upon which it was set.

For private residences the protector affords perfect security for all the more valuable property in the house. A good fireproof safe protected in this way is all that is required for a private house. The instant the burglar opens the door of the case, the alarm begins ringing, and notice is given inside and outside that burglars have effected an entrance. If burglars are heard in the house, and they have not approached the safe, the alarm can at once be set in motion, which will either drive them away, or call in the police. The safe, in a private residence, can be placed in any part of the building, and the alarm placed outside the sleeping room, over the sidewalk, or in any other convenient place.

The impossibility of tapping the cable, which is the vital point of the invention, is vouched for by scientific electricians, who have experimented long and arduously to test whether this could be done or not. No one has yet succeeded is establishing a current with a second battery through it without starting the alarm, and those who examine the cable will see that, to do this, insurmountable difficulties must be met with.

The invention was patented Nov. 15th, 1870, and August 1st, 1871. Further information may be obtained by addressing Hon. A. H. Cragin, Post building (Room 13), Hanover street, corner Beaver street, New York city.

An Italian Diving Bell---The Inventor Writing Letters at the bottom of the Sea.

The *Tolpa marina*, or marine mole, is a recent invention of Signor Toselli, of Naples, by which he descends into the sea with plenty of air and plenty of room, and is enabled to continue, for four hours, his minute scientific observations on surrounding submarine life at a depth of 31 fathoms (186 feet) under water.

This wonderful machine has been built at Sestri de Ponente, near Geneva, after Signor Toselli's plans, and the inventor made his first experiment in the Bay of Naples, on the 26th of August, in the presence of the local authorities and several officers of the Royal Navy. We give a translation of a description of the apparatus as printed in an Italian periodical, *L'Italia Nuova:* "It is 4 yards 8 inches long, cylindrical in form, and made entirely of iron and bronze. Its diameter is about 1 yard 4 inches. It is divided into four superposed compartments or diaphragms, the central one being reserved for the divers. The upper chamber contains the compressed air necessary for respiration during immersion. The lower chamber acts like the air bladder of fishes, as it increases or diminishes the weight of the machine proportionably to the quantity of water it displaces. Finally, the last compartment, which is at the end of the cylinder, is filled with the necessary quantity of lead to keep the machine in a vertical position, like an aerometer. Several holes, fitted with bronze round the surface, admit of various contrivances, without which it would be incomprehensible how a man, hermetically shut up in what may be called an iron castle, could catch external objects, secure them by the means of ropes, and collect them."

The same paper, in its following number (August 28) adds: "We have received letters from Naples, which confirm the reported success of Signor Toselli's first descent into the Bay of Naples, by means of his diving apparatus, at a depth of 35 fathoms—namely under a pressure of six atmospheres. . . The weather could not have been lovelier, nor the sea more calm. As soon as the crowd of distinguished invited witnesses had arrived at Baja—the chosen place for the experiment—they were met by Admiral de Viry and his staff.

"The experiment began about noon. After soundings had been taken, the machine, then empty, was sunk into the sea, and left for some time at the depth of 30 fathoms, to try if it would bear that pressure without being smashed; as soon however, as it was again seen floating upon the surface of the water without having received the slightest injury, the bystanders ceased to entertain doubts of Signor Toselli's safety, whilst he, perfectly calm, got into his marine mole, and descend d slowly to the bottom of the sea. The lowering of the machine through 30 fathoms of water took three and one half minutes. When, after awhile, it was seen floating again, and when the lid opened, and Signor Toselli came out smiling and serene, cheering burst out on every side.

"During his sojourn at the bottom of the sea Signor Toselli wrote the following report of his experiment to the well-known director of the Royal Observatory of the Vesuvium, Signor Palmieri, who was a witness of the experiment, and expressed himself highly satisfied with it:

"Sir: The sensations I experience at this moment are so strange and numerous, that, should I wait to write them down, I am sure they would slip from my memory.

"First of all I must tell you that the water here does not look like itself any longer, but seems really to be a motionless mass of transparent glass, quite luminous enough to allow of reading and writing.

"The bottom of the sea seemed at first to hurry towards me; then I saw it stop, and after a while glide away from me. I was quite astonished at this, and almost feared lest my eyes should be diseased; but by observing that the movements of the manometer kept in direct communication with the sea, I felt reassured, having at once surmised the cause of the apparent movement. When I fancied the bottom of the sea was running towards me, it was a proof that I was sinking with a certain speed; when the bottom seemed to have stopped moving, it was myself in fact who did not move; and when the bottom sunk rapidly as if running away from me, I was then ascending towards the surface.

"It is very amusing to see so many fishes swimming to and fro on all sides, and to be able to enjoy a curious spectacle without experiencing the slightest inconvenience.

"Such silence prevails here that it would seem terrible to some people; but I consider it, on the contrary, a peculiar sort of pleasure to breathe in such a medium.

"The barometer marks 81 centimeters of pressure, the igrometer in my cell indicates 26 degrees, and the one outside only 15. The manometer communicating with the sea shows the depth to be 31 fathoms. The other manometer still marks two atmospheres, which tells me that there is yet air enough in the chamber to allow me to stop here four hours longer, without running any danger of suffocation.

"All the contrivances of my machine perfectly answer the purpose I had in view, except the lid, which shuts and opens too slowly.

"I can venture to say that I have hit the mark at once. This makes me feel an indescribable joy, which I wish to share with you, and with all those honored and illustrious persons, who, by favoring me with their presence, have generously offered to my weary mind the best of all remunerations. Yours, &c.

"G. B. TOSELLI.

"From the bottom of the Bay of Naples."

Signor Toselli also wrote the following letter to the directors of the engine manufactory at Sestri di Ponente, which, we think, is almost as full of interest as his report to Professor Palmieri:

"*Messrs. Westermann Brothers, Engine Manufacturers, at Sestri*:

"I inform you, without delay, that I put my marine mole to the test yesterday, before several military, civil, and scientific authorities who had told me that the sea was much deeper at Baja than anywhere else in that neighborhood. They kindly deceived me out of anxiety for my life, for on reaching the bottom I could read on the manometer that the depth, instead of being 55, as I had wished, was only 31 fathoms. At any rate the depth to which I have descended is far below the depth which divers have as yet reached with their usual apparatus. The time, from the moment I signalled telegraphically for my departure from the bottom of the sea, to my arrival at the surface, was three minutes, as some bystanders said three minutes and a half, which constitutes a great difference in favor of my machine, if compared with what a common diver would have been able to achieve with his apparatus, which would have employed not less than 70 minutes to pierce the same thick layer of water. It is well known that the greatest number of fatal accidents occurring to divers are to be ascribed to the sudden transition from a very high pressure to a much lower one, and that they can only avoid this by ascending slowly at the rate of forty inches per minute, and not more.

"The pressure inside my marine mole being exactly the same near the surface of the sea as at a depth of 55 fathoms, I could dart with impunity from the bottom to the surface, like a fish, without experiencing any pain in my lungs. This is one of the greatest advantages of my invention, and of which I had not even thought or hoped before.

"I wish to share the pleasure of my triumph with all the clever mechanics of your establishment, who have built my machine with so much care. By acting thus towards them, I do nothing else than my duty, because I know how few people do justice to the great merit of those, who, with their tools and their exhausting labor, succeed in giving a *de facto* existence to the products of intelligence."

A New Gold Field.

The St. Paul *Press* says that great excitement now prevails at Winnipeg, Canada, over recent gold discoveries at Lake Shabondawan. Many specimens of gold dust, nuggets, and gold bearing quartz had been brought to Fort Garry, and, so confident were the people in general that a new Eldorado of unsurpassed richness had been discovered, hundreds at once repaired to the scene of the discoveries; and the latest information from that region has not only fully confirmed all previous reports, but exaggerated them to the extent of placing them among the richest mineral deposits in the world, outranking even California and Australia.

The government of the Dominion of Canada is engaged in establishing a road through the country between Fort William, on Thunder Bay, and the settlement on the Red River Valley, but all work on this thoroughfare has been entirely suspended, the workmen, to the number of several hundreds, having dropped their shovels, picks, and axes, and emigrated in a body to the gold fields, where they were each washing out with their hands four dollars and upwards. News of their remarkable success in finding gold in paying quantities had infected the sober citizens of Winnipeg, and the prospects seemed to be that even the fears of a Fenian raid from Pembina would be forgotten in the general desire to revel among the golden sands of the Shabondawan.

There would seem to be some foundation for these reports, for the locality mentioned is in the midst of one of the richest argentiferous regions on the continent. The early explorers of a route through the British possessions discovered gold and silver in this vicinity, and later investigations have shown that vast deposits of minerals are to be found along both shores of the great lake. Lake Shabondawan lies about forty miles due west from Fort William, and at least 400 miles from Fort Garry. This lake is only about ten miles in length and but two or three in width, and forms one of many small bodies of water in that section. It is bounded on the south and west by a mountainous and broken country, through which flow several small and rapid streams.

Lake Shabondawan is but a short distance from Silver Islet in Lake Superior, said to be the richest silver mine in the world, and not over 150 miles distant from the copper mines of Ontonagon. There are, therefore, reasonable grounds for believing that these discoveries may prove to be as valuable as they are reported, and that the extensive prospecting of experienced gold hunters, which is sure to follow, may yet develope mineral resources north of Lake Superior as vast as those which have attracted hundreds of thousands of people to the western slopes of America and the islands of the Pacific.

Water for Fires.

The present is a fitting time to consider, says the Chicago *Tribune*, whether we may not improve our present system of water supply, in order to make it more efficacious in case of fire.

In the city of Montreal, the supply of water is obtained from an artificial reservoir two or three hundred feet above the city; the supply is unlimited, and any householder, by attaching the hose, can have a stream of water, which, by its own force, can be thrown 123 feet high against the resistance of the air. This obviates the necessity of steam fire apparatus, the water itself ascending higher than it can be forced by any steam engine. To secure this same result is the principal feature of the Holly system. We have an abundance of water, but no elevation. The great steam pumps force the water up a column, by which a head of less than one hundred feet is obtained. This force, however, is not maintained in the distribution, and half a mile distant it does not rise above thirty feet, and diminishes until at a distance of two miles it does not rise above twelve feet, and often not over six feet. This arises from the impossibility of the pumps keeping the distribution mains full at all times.

The inflow of water from the lake is far in excess of the capacity of any existing machinery. From the wells of the tunnel, there might be supplemental tunnels to various points of the city. Other tunnels might be constructed into the lake. The city might be divided into fifty or more convenient fire districts, and in each of these districts there might be such wells, supplied from the lake, incapable of exhaustion. This having been done, there might be erected over each well a pump, by which this water could be given a force equal to an elevation of one hundred feet. This would place the public in a much better condition, as against fire, than it is now with the steam engines. The main items then needed would be hose and fire plugs. Every building could have its own hose and fire plugs, and upon the first appearance of fire, the roof, or any room in the highest building, could be instantly flooded with water. At present, an ordinary fire, occurring in the upper story of any large building, has time to obtain a fierce headway before the engines reach the place; and, before the hose can be laid and dragged up ladders, and the water forced to that hight by the engines, it is impossible to save the building. In the case of the Drake-Farwell Block fire, thirteen months ago, the water could not be forced to to the roof, and building after building burned from the roof downward. The engines could not force the water to that hight. Had there been a head of water ascending seventy-five feet, one man standing on the roof with hose could have confined the fire to the building in which it originated, and the loss on even the latter might have been prevented. In Montreal, there can be no extensive fire resulting from an insufficient supply of water or insufficient force. Each man, with sufficient hose, can exercise as much power as can be used by a steam engine in Chicago. As this water can be thrown from the roofs of the highest building as far upward as it can be thrown by a steam engine from the ground level, no machinery or steam power is required in order to make the water effectual against fire. The wells for the supply of water for fire purposes could easily be obtained from the river. The piping for that purpose can be easily laid, and of a much cheaper material than that used for the general distribution. This same water could be used for manufacturing purposes, for livery stables, and for a variety of purposes, thereby reducing the demand upon the present water works. It would be comparatively inexpensive. The machinery once erected, the cost of working it would be but trifling. The cost of piping could not be one fifth of the cost of the ordinary water mains. This pipe could be laid at once in every street in the city, and the annual cost of maintaining the whole would not equal one third that of the requisite number of steam engines under our present system. We might erect water towers in each fire district and obtain additional head, but either plan is feasible to supply the great natural want of Chicago, a supply of water from an elevation. That want must be supplied. Our present system cannot do it, and now is the time to consider and adopt some plan by which the end can be obtained.