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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 373,

For the Week ending February 24, 1883.

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PROJECTS FOR INCREASING THE WATER SUPPLY OF NEW YORK CITY.

A committee has been holding daily sessions to consider projects and receive suggestions relating to an increase in the water supply of this city. It is admitted that the need of such an increase is urgent. The largest capacity of the present Croton aqueduct is 100,000,000 gallons a day, and this at a pressure that seriously imperils the integrity of the structure. The engineers in charge agree that the aqueduct ought not to be made to carry more than 72,000,000 gallons a day. The present storage capacity is about 9,000,000,000 gallons. The Bronx River aqueduct, to be completed next year, will increase the supply about 20,000,000 gallons a day. A large proportion of the present supply is wasted. Mr. John C. Campbell, formerly chief engineer of the Croton aqueduct, estimates the waste at "about 50 per cent of the entire amount of the water furnished by the aqueduct"; this partly through the carelessness of consumers, but largely through leakage from the water-mains.

Could all the waste be prevented, the supply already provided might answer for the present, but it would soon become inadequate through the natural growth of the city. If the city increases during the next quarter century as it has during the past twenty-five years, there will be needed from 250,000,000 to 300,000,000 gallons of water a day. The question is, how can the requisite provision be made, not merely for the immediate future, but, if possible, for centuries to come?

The Department of Public Works is in favor of building a dam at Quaker Bridge, six miles below the Croton dam, to retain the water which now flows over the latter in seasons of abundance, with a new aqueduct to deliver the water thus saved. The supply of the Croton watershed, it is claimed, is sufficient for a population of 5,000,000.

To this plan it is objected that the proposed dam would have to be larger and higher than anything of the kind before attempted, and possibly hazardous, and that the Croton region is becoming so populous that the sources of contamination must soon become so numerous as to seriously injure the quality of the water supply from that valley.

Other plans for the better husbanding of the waters of the Croton region contemplate the damming of the east branch of the Croton, by which means, it is claimed, additional storage can be provided for 4,000,000,000 gallons. The amount of water flowing from the Croton watershed varies from 250,000,000 to 600,000 gallons a day.

To lessen the demand for Croton water, it is proposed to supplement the fresh water supply with salt water drawn from the adjacent rivers, for the use of the fire department, for flushing the streets and water-closets, for water power, and so on. This to be done either by direct pumping under the Holly system, or by a reservoir system. One engineer proposes a huge water tower in the middle part of the city below Central Park, the tower to be 100 feet in diameter and 350 feet high above tide water. On the top of this tower he would place a reservoir holding 2,000,000 gallons, to be pumped up from the river.

These methods would involve a new set of water mains and pipes, to cost, according to the estimates of Mr. Isaac Newton, chief engineer of the Croton aqueduct, more than would be required to furnish the city with the requisite additional supply of fresh water.

Another plan of drawing upon the Hudson River contemplates a pumping station above Poughkeepsie, the water to be brought in an open canal, or through pipes, to this city. This plan would necessitate the lifting of the water at both ends of the aqueduct, which would be expensive, and the propriety of drawing water from a river which has received the sewage of large cities like Troy, Albany, Hudson, and the rest, would be extremely questionable.

Other schemers propose to go still farther up the Hudson, to its upper reaches in the Adirondack region, or to Lake George, a distance of nearly two hundred miles, the water to be conveyed part of the way in an open channel, the rest in closed pipes. The supply is vast, the water of the highest purity, and all the cities along the Hudson River could be provided for in one scheme. The project is a gigantic one, and not likely to be seriously undertaken for many years, if ever.

Two other general sources of fresh water are under consideration. The Housatonic River might be dammed near Falls Village, Connecticut, and the water brought by open canal and tunnel into the Croton valley, a distance of forty miles. This is a project of Mr. Allen Campbell, formerly Commissioner of Public Works. The estimated cost of supplementing the Croton valley supply, in this way, is about $2,000,000. To this would have to be added the cost of a new aqueduct from Croton to the city, which might better be used in bringing to us the Croton water now allowed to run to waste.

The proposed sources west of the Hudson are the Hackensack, Ramapo, and Passaic rivers of New Jersey, and the lakes of Orange and Rockland counties, New York.

To draw from either of the New Jersey rivers would involve the passage of the Hudson, and either tunnels through the Palisades or costly pumping works to carry the water over them. These sources are open to the further objection that all the available water on that side of the Hudson will be needed, sooner or later, for the numerous populous cities growing there.

The lake region of Orange and Rockland counties is scarcely better fitted for the supplying of New York. In that territory are ten lakes, with a storage capacity of 8,500,000,000 gallons, available sites for ten artificial reservoirs, and adjacent lakes and watersheds capable of yielding 100,000,000 gallons a day, 300 feet above the tide level. But they are on the wrong side of the Hudson River.

TORSION TESTS OF CAST STEEL.

Some very careful tests have been recently made, to ascertain the relative resistance to torsion of tool cast steel in its unannealed form, as it comes from the manufacturer and is cut off the bar; in its annealed condition; and as hardened for tool purposes to be used on iron, as taps, reamers, drills, and similar tools that are worked by torsion.

It is not generally supposed that hardening and tempering cast steel increases its torsional resistance: on the contrary it is usually accepted that resistance to torsion depends mainly on toughness—the coherence of fibers when twisted—and that this toughness is much diminished by the process of hardening. But in the tests to which reference has been made, from a number of different manufacturers, the specimens that showed the least torsional strength, when hardened, were yet one and a half times stronger, or resistant to twisting, than unannealed specimens from the same brand. To be more exact, the figures for the unannealed were 5,114, the annealed 5,166, and the hardened 7,596, being an increase in torsional strength of the hardened and tempered specimens over the annealed and the unannealed of more than 33 per cent. Other specimens—those of different brands—showed a still wider difference between unannealed and hardened conditions: as of 5,010 unannealed, and 8,418 hardened; 5,346 against 8,814; 5,124 against 7,920; and of 5,100 against 8,232. These figures may represent pounds, as they actually did in the tests, the pieces tested being of round steel minus five-eighths of an inch diameter, with a distance between shoulders of two and three-eighths inches. The hardened specimens had been hardened and then drawn to a straw color, leaving them as hard as any tempered tool used for working metals, and inferior only to the file, which is not tempered, or drawn, at all.

One of the peculiarities of the tests was that so slight a difference existed between the torsional strength of unannealed steel and that which had been carefully annealed twenty-four hours, the results showing slightly in favor of the specimens tested as cut directly from the bar. The following shows the comparison:

Unannealed..	5,514	5,010	5,346	5,124	5,100
Annealed.....	5,166	4,572	4,864	4,128	4,552

From this it appears that no increase of toughness, or of resistance to torsion, comes from annealing cast steel. But annealing is valuable in rendering the steel more amenable to the action of the cutting tool.

PROGRESS OF MUSIC IN JAPAN.

An interesting reception was given at the New England Conservatory of Music, Boston, Feb. 6, to Prof. Luther Whiting Mason, on his return from a three years' absence in charge of the music in the public schools of the Japanese Empire

At the time of our Centennial Exhibition in 1876, the commissioner from Japan was impressed by the manner in which music was taught in the Boston public schools, and his recommendations led to the calling of Prof. Mason to take charge of the musical instruction given in the schools of the Empire. Prof. Mason had not only to introduce new methods of teaching, but a new order of music, and his success speaks well not only for his methods but for the tolerance and teachableness of the Japanese people, to whom he is about to return. At the reception he explained the development of his method of teaching Japanese children, and exhibited a number of beautiful gifts he had received from the Empress and other people of distinction in Japan. Professor Mason carries back with him as a personal gift to the Empress a handsome crystal vase on which is engraved her portrait. The engraving was done in Munich, and is a fine example of the highest style of the art.

SHALL FAILURE TO DEVELOP FORFEIT PATENT RIGHTS?

It is not an unfrequent occurrence for individuals and corporations having large sums invested in patented machines and processes to take out or purchase rival inventions for the purpose of preventing their development. Where a change of plant would entail a heavy loss, the manufacturer naturally prefers to go on in the old way. He does not want to risk making a bankrupt of himself to introduce improvements for the benefit of others. Accordingly, if he sees where a radical improvement can be made in his work he obtains a patent for it, if he can, and thus forestalls a possible rival. Or, if another man makes an invention which, if put into use, would compel the established manufacturer to adopt it to his temporary or permanent loss, or else retire from the competition, the manufacturer is bound to suppress the rising tyrant if he can. Probably three manufacturers out of every five are owners of patents which they have thus taken out or purchased for their own financial protection.

Occasionally the suppressed inventions are big with promise of benefit to the world, and it is something of a hardship to the public to see the dog-in the-manger policy pursued with regard to them. Of this nature are some of the undeveloped patents for improvements in steel making controlled by the Bessemer Steel Organization.

To prevent such practices a bill has been prepared to be submitted to Congress, with a view to legislative action to

break down (in specified cases) the exclusive monopoly enjoyed by patentees. The proposed law provides :

"1. That all associations or combinations, either of natural persons or incorporated companies, formed for the purpose of purchasing a patent or patents for any process of reducing iron ore to steel or iron, with the intention of withholding the use thereof from the public or from individuals or associations desiring to use the same, are hereby declared to be unlawful, and any purchase or attempted purchase of any such patented process by any such association or combination for the purpose or with the intention of preventing the use of the same, shall be construed to be an abandonment to the public at large of all exclusive rights under any such patent.

"2. That where any person, association, or incorporated company shall own, or claim to own, any patented process for reducing iron ore to steel or iron, such owner or claimant is hereby required to issue license to use such patent process to any person, association, or corporation who may desire to use the same in the manufacture of iron or steel. Said license shall be granted upon such terms as may be just and reasonable, to be agreed upon, if practicable, with the owners thereof. If a satisfactory agreement cannot be made, the person or association desiring to use said patented process as above set forth, is thereby authorized to apply to any Circuit Court or District Court of the United States where the owner of said patent or any of them resides, or may be served with process, to have the value of such license ascertained by commissioners to be appointed by said court or by empaneling a jury, as either party may elect, to ascertain the value thereof. Such proceedings shall, as near as practicable, conform to the proceedings for the appropriation of private property for public use as are prescribed by the laws of the State wherein the proceedings hereby authorized shall take place.

"When the value of such license thus applied for shall have been ascertained, as herein provided, the court in which such proceedings are conducted shall enter a decree or judgment setting forth the same, and shall direct the manner in which payment for said license shall be made, and shall make such further order in the proceedings as shall duly protect the rights of all the parties thereto. As soon as the party applying for said license shall comply with the orders of the court, he shall be entitled to use said patent process in accordance with said judgment or decree.

"3. Jurisdiction to conduct the foregoing proceedings is hereby conferred upon all circuit and district courts of the United States."

This is a new phase of an old scheme, and, as usual, one palpable, though comparatively small, wrong is made a pretext for legislative action calculated to introduce or open the door for vastly greater wrongs.

Grant that it is an injury to the community to delay or willfully prevent the development of a new and useful invention. Grant that the proposed law would tend to prevent such delays. Has Congress the right to prevent such wrongs in the manner prescribed? Would it be good policy to remedy the evil in that way, the right being clear?

While Congress is constitutionally authorized to shorten or lengthen the lifetime of patents for invention, or to abolish the patent system entirely, the Constitution gives it no authority to provide for the issuing of letters patent for other than the exclusive right to make, vend, and use the thing or process patented. If Congress can make void one class of legally-issued patents for the specified reason, why not all patents that may be withheld from use? If Congress can compel one class of patentees to issue licenses, why not all patentees? By what authority is Congress to enact a special law, a law applicable only to makers of iron and steel?

The trouble with those who desire legislation of this sort arises from the narrowness of their view. Their selfishness is too short-sighted to be wise.

It is obviously a misfortune to have a useful invention withheld for seventeen years; but the misfortune would be vastly greater if the invention were to be absolutely suppressed, kept secret by the inventor to die with him; and greater still if inventors were debarred or discouraged, as they would be under such a law, from trying to make "new and useful inventions."

Seventeen years is but a little time compared with the life of the nation. It is unquestionably desirable that all novel ideas shall be immediately worked out as factors of industrial progress; but the country can better afford to wait a few years for their development than to hurry them by means calculated to hazard their very existence.

The patent system is designed not for the rewarding of inventors, but for the advancement of the useful arts and sciences. That advancement is to be secured primarily by the immediate registration and publication of novel ideas to serve immediately or remotely for the instruction and guidance of all workers in arts to which the new ideas are helpful; secondarily, by giving the patentee a temporary control of his invention, to incite him to make greater efforts and to justify larger expenditures to hasten the practical development of his invention. If the latter incentive fails, and the invention remains unimproved for the full term of the patent, the public is still the gainer. The disadvantages attending the occasional willful holding of a patented invention in abeyance are vastly more than overbalanced by the advantages which flow from the prompt admission of new ideas into the world of creative thought; and ultimately the public enjoys the full and free use of the invention specified. Further, the disadvantages chargeable to patents temporarily withheld from use are out of comparison with those which would certainly result from an invasion of the patentee's exclusive control of his invention during the lifetime of his patent. The proposed law would at once destroy a large part of the incentive to invention which the patent laws now hold out, and at the same time a large part of the patentee's inducement to spend the money necessary to develop and perfect his invention. Under a license system the inventor's rivals would share all the advantages of his success without having shared any of the preliminary risks and expenditures.

THE ZEBRA WOLF.

BY DR. G. A. STOCKWELL.

Of all the mammalia, none possess so much that is interesting and peculiar as the so-called marsupials or pouched animals; and excepting the opossums, strange to say, this class is confined exclusively to Australia, Tasmania, and the isles of the Papuan group. With kangaroos, petauristes, wombats, and "ursine devils," we are more or less familiar, through the mediumship of zoological gardens, traveling menageries, and the writings of accredited travelers; but the Tasmanian or zebra wolf is almost unknown, and so far as the writer has been able to discover has been exhibited in captivity only in a single instance. Two specimens were obtained by the Royal Zoological Gardens of London, England, but quickly died, pining away through confinement, and, perhaps, disease brought on by a two months' sea voyage and change in climate.

The peculiar modification of the nutrient organs that has given rise to the title *marsupial* (from marsupium, a pouch), is the peculiar sac provided the females for the protection of their immature young. This is developed in a greater or less degree in each species, but may easily be studied in our common or Virginian opossum, whose chief place in the world seems to be to provide Sambo or Cuffy the material for a Christmas dinner, peculiarly his own. Mind you, I do not decry its edible qualities, but would merely suggest its being far more interesting under the dissecting knife than at the festal board. Examination reveals the pouch to be supported by two elongated bones that project, or are rather prolonged, from the crest of the hip, and which lie just beneath the skin and in the same general plane with the back; and within this pouch are concealed the breasts or mammæ.

When the young marsupial is first ushered into the world it is a tiny and helpless being, of such minute size as to be out of all proportion to its parent; even the young of the bush kangaroo, an animal nearly or quite as large as our common deer, being scarcely larger than newly born rats; and they are blind, naked, and even incapable of voluntary movement. As quickly as born the youngling is seized by the lips of the mother and at once conveyed to the interior of her pouch, meantime held open for its reception by her forepaws, and placed upon the breast, to which it at once clings instinctively, not again releasing its hold until of considerable size and capable of voluntary exertion—a matter of weeks, sometimes months. Once so placed, the little one demands little attention, and to all intents and purposes is as much a part of its parent as during the period of gestation. It would seem to be incapable of again letting go its hold, as the muscles of the mouth at once contract so strongly about the bulbous portion of the nipple that even in death separation is effected only with some difficulty.

I have said that the wee marsupial is incapable of voluntary movement. This is so much the case that it has not the power to draw the nourishment from the maternal fount, or even swallow when once its mouth is filled; consequently, the mother is provided with a supernumerary muscle that, passing over the glands, compresses them at her will, forcing the milk directly into the little one's stomach, and at this time, too, Nature has wisely provided to prevent strangulation by elongating the larynx or windpipe to the nasal cavity, so that it is joined to and forms at once a part of the nostrils themselves, thus allowing breathing and feeding to go on simultaneously. When able to feed itself, this prolongation is gradually absorbed. As the youngster now approaches his more perfect form, his eyes are loosened from their bands and the tender skin is covered with a coat of hair, and he begins to act more like the offspring of other animals. Now his mouth is under control, and he can release himself and feed at will; and in the spirit of curiosity frequently puts his head out from the sheltering pannier to survey the surrounding world; and finally ventures therefrom in search of more solid food than that to which he has been accustomed, though still retaining the pouch as refuge when fatigued or shelter when threatened with danger. With some animals it is no uncommon affair to find young of different ages occupying the pouch at the same time—some almost ready to be emancipated, the others weak and imperfect creatures of recent birth.

It is strange that all the mammals of Australasia are marsupials, from the pygmy pitaroo and the haunting phalangers up to the giant kangaroo. To the same class belongs the zebra or Tasmanian wolf, an animal far the most formidable, as it certainly is the most savage of indigenous quadrupeds. Too feeble and cowardly to successfully attack man, it is, nevertheless a terrible pest, committing serious ravages among all other creatures, irrespective of form or habits of life, the wombat alone excepted. No matter how hungry he may be, he will not touch this fat and sluggish marsupial, though, as it subsists on fruit alone, it would seem to be most edible. By no means swift or agile, and sneaking and crawling in habits, the zebra wolf nevertheless manages to kill the kangaroo in defiance of its boasted leaping powers and powerful claws of its hind feet, and to secure the ornithorynchus, or common duck bill, in spite of its subterranean burrows and natatory habits. It does not even hesitate to seize upon and devour the prickly echidna, a much more formidable mouthful than any porcupine; and even prowls the sea shore searching for food among the heterogeneous masses flung up by the waves, renewed or added to by each succeeding tide. Shore crabs, which dot the beach in numbers after every flood, are caught with no little dexterity, and mussels and limpets are readily detached from the rocks, while the carcass of a seal or fish, or the body of a wild fowl, no matter how oily or fishy, serves as a tidbit. As quickly, however, had civilized man taken up his abode in Tasmania, the wolf became an object of dread, as poultry and domestic animals were never safe from its attacks. The sheep especially became the objects of the settler's anxious care, for no sooner were they introduced than a most unmistakable appetite was developed for mutton, seemingly preferring the flesh of that useful and easily mastered animal to that of any kangaroo, however venison-like, or bandicoot, howsoever savory.

In size this wolf approaches a large setter or Newfoundland dog, averaging perhaps a little more than five feet in length from snout to tip of tail, the latter appendage claiming a little more than one-third of the measurement; but specimens are sometimes killed that exceed this by half a yard; at the shoulders it is some twenty or twenty-two inches in height. The feet are protected on their bottoms by rough pads, and the toes, of which there are five on the fore feet and but four on the hinder ones, are all armed with short, straight, powerful claws. The head is very like that of a dog, the muzzle being long, narrow, and pointed, with a white, grizzled upper lip, sparsely sprinkled with a few black hairs, a few of which also ornament the cheeks and ridges above the eyes. The ears are sharp, pointed, erect, very broad at their base, and covered with hair both without and within; while the eyes are sharp, full, and black, and protected with a false or nictitating membrane like the owl, to shut out the unwelcome light of the sun, for it is nocturnal in habits, rarely venturing out during the day, but hiding in the recesses of the rocks among which it chiefly dwells. Of a general grayish-brown hue, mixed with yellow, banded above with a series of black stripes, which beginning at the shoulder diversifies the whole back to the tail, gradually increasing in length on the haunches and prolonged on to the thighs, it is this marking which gives rise to its many names of zebra, hyena, and tiger wolf.

There are several reasons why the animal is seldom exhibited in captivity. First, they are exceedingly sly and wary, and are hidden in dens most difficult of access, where daylight seldom penetrates, and where the female brings forth her young, four at a litter, remaining with them and supplied with food by her spouse until they are able to care for themselves. Second, when brought to bay by dogs, they fight with incredible fury, and yield only when torn in pieces. Again, the hatred of the settlers is so intense, that scarce any reward is sufficient to purchase the life of a captured animal.

Formerly they were quite prevalent in Tasmania; they would seem never to have been known on the continent of Australia, but by degrees the guns, traps, and poisoned baits of the settlers have prevailed, stimulated perhaps by the bounties offered; and the war of extermination has waged so fiercely, that the wolves have been driven from the haunts that once knew them, the few survivors being confined to the wildest and most inaccessible regions of the Humboldt Mountains and Hampshire Hills.

Preservation of Butter.

Dr. W. Hagemann has observed that cow butter contains 0·5 to 0·6 per cent of milk sugar, which under the influence of bacteria is transformed into lactic acid, and this liberates from the glycerides the acid, containing less carbon. It is obvious from this that summer butter becomes rancid more rapidly and strongly than winter butter, and that for the preservation of butter two methods may be adopted, viz., either the lower fat acids are removed by soda solution, as proposed by Adolf Mayer and Dr. Clausnitzer, or else the milk-sugar must be removed, or its decomposition prevented by suppressing the vegetation of the bacteria.—*Chem. Ztg.*

Treatment of Bulbs.

An ounce of nitrate of soda dissolved in four gallons of water is said to be a quick and good stimulant for bulbs to be applied twice a week after the pots are filled with roots and the flower spikes are fairly visible. A large handful of soot, or about a pint, tied up in a piece of old canvas and immersed in the same quantity of water for a day or two, will give you a safe and excellent stimulant; also good and safe is a quarter of a pound of fresh cow-dung mixed in a large garden pot of water and used as required. Any of these stimulants will do good, as the whole of them applied alternately will benefit bulbs that need more sustenance than the soil affords.

Photograph of Comet's Tail and Stars.

Dr. Gill, at the Cape of Good Hope, succeeded in photographing the comet's tail and with it fifty stars that were seen through the tail. The plate was exposed 140 minutes, and was kept up to the motion of the earth by clockwork.