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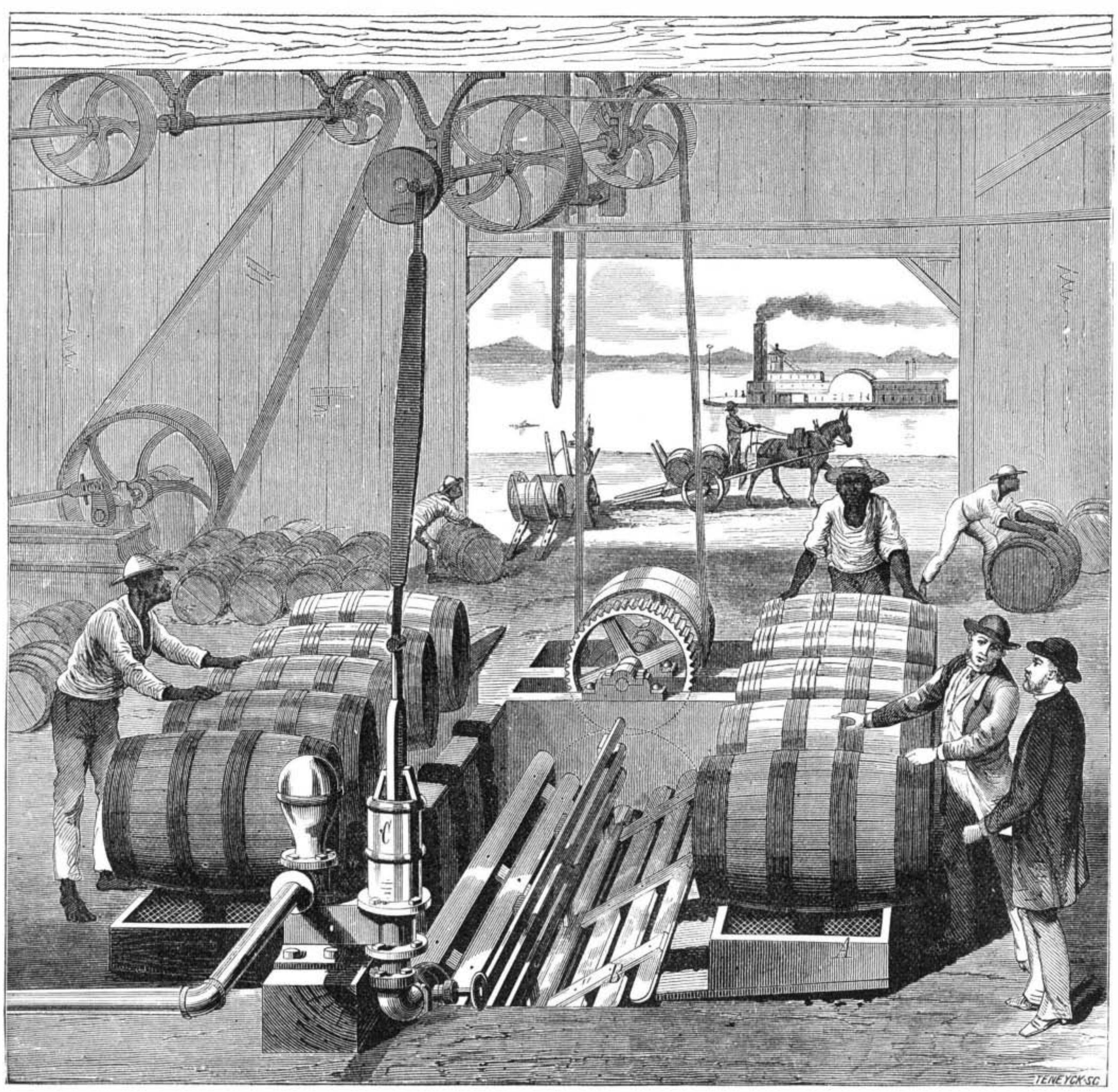
IMPROVED LIQUID MIXER.

Molasses is usually supplied to the markets in four grades—common, fair, prime, and choice—and to obtain these different qualities, it is necessary to mix together large amounts of the liquid at a time. The apparatus represented in the engraving is designed to facilitate this operation. It may also be employed in any other cases where the mingling or equalizing of fluids in bulk, as in refineries, distilleries, etc., is required.

The mixing vessel or vat is conveniently located in the ground, or beneath the floor level. At both sides are arranged boxes provided with strainers, A, through which the liquid escaping from the barrels, which are rolled, bungs downward, upon the tops of the boxes, is filtered. The bottoms of the boxes are inclined so that the fluid runs to an opening at the inside, and thence into the vat. Within the latter, and placed longitudinally is a stirrer wheel, B, which is revolved by suitable power transmitted from the engine, and by means of which the liquid collected is thoroughly mingled. When the operation is finished, the wheel is stopped, and the contents of the vat are drawn off by the pump, C, operated from the driving shaft, as shown, and through a suction strainer set in a draining box at the bottom of the receptacle.

Large quantities of liquids may thus be handled easily and mixed in a short space of time, while being also strained from any coarse impurities, in the passage to the mixing vat.

Patented through the Scientific American Patent Agency, July 20, 1875. For further information address the inventor, Mr. John B. Meyers, 475 Josephine street New Orleans, La.



MEYERS' LIQUID MIXER.

Prizes for Metallurgical Improvements.

The *Société d'Encouragement pour l'Industrie Nationale* (offices at Paris, rue de Rennes, 44) offers a prize of $600, to be competed for in 1876, for a process of manufacture of cast steel rails from common ores, containing from 0·50 to 1·50 per cent of phosphoric acid. In 1876 will likewise be accorded the D'Argenteuil prize of $2,400 for the discovery or improvement of the greatest consequence to French industry; and in 1879 the society's own prize, of the same amount for the same object. Other prizes are: (1) $600 (in 1876) for a steam engine of from 25 to 100 horse power, burning 1·54 lbs. of coal per horse power per hour, the engine weighing less than 720 lbs., and costing under $80 per horse power. (2) $200 (in 1878) for a small motor for domestic purposes. (3) $400 (in 1878) for specified improvements in flax and hemp spinning. (4) $400 (in 1879) for cotton carding. (5) $400 (in 1880) for a file cutting machine. (6) $400 (in 1877) for a method of obviating the shock and vibration of heavy machinery, such as steam hammers. (7) $200 (in 1876) for any useful application of the recently discovered metals—calcium, magnesium, strontium, thallium, etc. (8) $200 (in 1876) for a new alloy useful in arts (9) $400 (in 1877) for artificial graphite for drawing pencils. (10) $600 (in 1877) for the artificial preparation of compact black diamond, for obtaining a powerful means of action in working iron, steel, and precious stones. (11) $1,200 (in 1878) for a theory of steel based upon experiment, and having for its object to better regulate the manufacture of steel. (12) $200 (in 1876) for the establishment in France of a workshop for the complete treatment of the ores of nickel, and the preparation of the pure metal, the nickel ores from the Alps, the Pyrenees, and Algeria being at present only treated for smalt, and then sent away, to Germany more especially, for the extraction of the nickel. (13) $200 (in 1880) for means for the economical production of high temperatures. (14) $400 (in 1878) for a means of hindering soot from adhering to the walls of chimneys, so that they may be fully cleansed.

New Allotment of Space at the Centennial.

The Centennial Directors have abandoned their original idea as to allotting space, which by the way was never formally adopted, and, for the very convenient arrangement of placing nations across the building and groups of similar objects longitudinally, have substituted the far less sensible plan of putting each nation's exhibit promiscuously within a certain area. The beauty of the first scheme was that, to inspect the display of any one country, the visitor had only to enter the proper side door and walk across the hall, the whole exhibit being in the zone traversed; or, if he desired to examine, say all the cotton machinery of the world, he would simply begin at that class of mechanism at the end of the building and walk its entire length, in so doing crossing the space of each nation where cotton machinery had been placed. There were plenty of objections to the plan, good as it was, which need not be detailed, since the new one has been definitely adopted. The United States now occupy about one fourth of the floor space, and the areas next in point of size are allotted to England, Germany, and France, the four great nations being grouped together. The other countries are scattered apparently without regard to their geographical position. The areas allotted thus far, according to the new plan, are as follows: United States, 166,351.7 square feet; France and colonies, 43,314; England, 51,776; Germany, 27,705; Austria, 24,070; Canada, 24,070; Australasia, 24,070; Sweden, 15,358; Belgium, 15,358; Japan, 16,566; Netherlands, 8,167; Norway, 6,897; Switzerland, 6,646; and Denmark, 5,647.

The Treatment of Hydrophobia.

The French *Journal des Connaissance Médicales* relates that a man, 43 years of age, having been bitten by a mad dog, was cauterized with a red hot iron four hours later. A month passed without any distressing symptoms, but at the end of that time he began to complain of epigastric and pharyngian constriction, and was very much cast down. Recourse was had to chloral at doses of about sixty grains, which succeeded twice in affording a good night's rest; but the third time it remained without effect. The patient experienced great anguish; his voice was hoarse; he had tetanic contractions in the arms, neck, and breast, and expressed great fear, accompanied with hallucinations. In the morning he was utterly discouraged.

They then administered sixty grains of bromide of potassium, which gave a quiet night, with a great improvement on the following day. Another dose of about seventy-five grains was given with equal success; all convulsive motions had disappeared.

The medicine being suppressed, the convulsions began again a week later, when bromide was again administered to the amount of about ninety grains, which completed the cure. This remedy is readily tried, and we shall be glad to hear of any results that our readers can communicate.

Southern Pacific Railway.

Any one, says the *Los Angeles Herald*, desiring to obtain any idea of the stupendous accomplishments of railroad engineering should spend a few day at Tehachape Pass, investigating the operations of the Southern Pacific Railroad Company. About twenty miles of that road is a succession of cuts, fills, and tunnels. Within this distance there are thirteen tunnels, ranging from 1,100 feet to a few yards in length. For the greater portion of the way the road bed is cut through solid granite. The elevation is so great from the present terminus of the road, at Caliente, to Tehachape Valley, that the first mile and a half out of Caliente is attained by laying down eight miles of track. Higher up in the pass the road runs through a tunnel, encircles the hill, and passes a few feet above the tunnel. After completely encircling the hill, and going half round again, the track doubles on itself like a closely pursued hare, and, after running several miles in the opposite direction, strikes up the cañon. This circling and doubling is for grade. Once the track crosses the pass, and this involves the building of a long and very high bridge. We doubt if a more difficult and expensive piece of engineering was encountered in the building of the Central Pacific over the Sierras than that with which the Southern Pacific is now struggling in Tehachape Pass. Another tremendous piece of work is the San Fernando tunnel, which when completed, will be over a mile and a half in length, and in places over 1,000 feet beneath the surface. Yet the company will accomplish this great work, and run cars through from San Francisco to Los Angeles, by the 1st of next July. All the force that can be used is kept at work on the San Fernando tunnel. In the Tehachape Pass 5,000 men are employed, and the force is being increased at the rate of 1,000 Chinamen per week.

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NEW YORK, SATURDAY, OCTOBER 2, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

A NEW USE FOR CRIMINALS.

Even vermin have their uses, say the pessimists. It is a cheering theory, and one which we should rejoice to see demonstrated, especially with reference to those vermin of society, the criminal classes.

Thus far they certainly have been the reverse of useful. Not only have they been a serious detriment always, to national prosperity through their depredations upon life and property and public peace, but also by their vicious example, and, more effectually still, by the transmission of their vicious traits to after generations.

Our present mode of dealing with them labors under the double disadvantage of being very inefficient and very costly. Every year sees the machinery of justice become more magnificent and burdensome, yet it none the less fails either to cure or to materially lessen the evil. Indeed the law has often more terrors for the good citizen than for the bad: he has a large bill of costs to pay at any rate; whereas the rascal who plunders him has everything to win and very little to lose. If he escapes, which is most likely, he gets the booty: if caught, he simply loses for the moment what is no use to any one—his liberty.

Is it not time for the well disposed, the innocent, and the law-abiding to turn the tables and recoup themselves, if possible, for their numerous losses? The ways in which this can be done are as numerous and varied as the varieties of criminal constitution and character.

Just now the authorities of Massachusetts are puzzled to decide what to do with the murderous Pomeroy boy. Hang him! said the court: and the multitude re-echoes the cry. That is an easy way to get rid of him; but will it pay? What good will it do to kill him? His death will not atone for the damage he has done, nor will it deter another of like mental and moral perversity from the commission of similar crimes. Then why throw away all the possibilities of use and instruction which his peculiar character affords?

In a case of this sort, vindictiveness is folly. The boy is what he is through conditions of heredity and culture which ought to be investigated. He represents a stage of human development or atavism which ought to be understood. What was the antecedent stage, and what will the next one be? His character is likely to change with increasing years; what is the direction of that change? Education and moral training are supposed to have a determining influence upon character; what can they do for him? The boy is a very bundle of scientific problems; why not keep him for investigation? For the solution of many of the problems of culture and civilization, he is worth a dozen ordinary children. He ought not to be thrown away. Make it impossible for him ever to transmit his vicious nature to a future generation, then investigate him, and all others like him, for the good of the race.

Apply the same principle in a different way to a very different character, say the once famous, now infamous, Colonel Valentine Baker, late of the British Army: a man of years and high standing, whose irrepressible impulses led him to make criminal assault upon an unprotected fellow traveler. He has lost his place in the army and in society; he has been fined and nominally imprisoned; but his impulses remain unaltered, and his example—punishment and all—seems to provoke others to similar deeds rather than to deter them; for his unusual offense has been since repeated by several. And when he returns to the world, his term of idle imprisonment ended, he will be simply what he was at first, lacking the restraining influence of his rank and possibilities of usefulness.

This may be justice, but it is not good policy. What was needed in his case was chiefly the extirpation of the cause of his uncontrollable passion—which any surgeon could have done in a few minutes—to destroy the only element of danger in his character.

In a rude state of society, the usefulness of a public offender is necessarily measured by his power to do rude work, in the quarry, the mine, or the like. We have arrived at a stage when a portion of our superabundance of such characters can easily be put to more profitable uses; though we should by no means personally object to the employment of the more able-bodied criminals in that way, especially in the coal mines. Instead of manufacturing for such needful service a degraded and largely criminal class—a process which any one can see in operation by visiting a coal-cracker among the Pennsylvanian mountains, where swarms of ill bred children spend their days at hard labor under the most debasing influences—it would be infinitely better to have the work done by ready made criminals, drafted from the country at large. It would be a saving of virtue, and possibly in the cost of coals. But there are still better uses to which the majority of criminals can be put.

Among the most important problems of civilization are those relating to health and disease. Of very few human maladies can it be said that we know their causes, their natural history, their effects upon the physical and mental organism, or a satisfactory mode of treating them. As little do we know how to prevent or avoid them. Yet of what vital importance is such knowledge to the well being of society!

The limited positive knowledge which Science has acquired of the ills which flesh is heir to has been gained through observation complicated by a thousand unknown conditions, through experiments upon unoffending animals, and by dissection of dead. During the middle ages, the last mentioned source of knowledge was barred. Every scholar knows what sudden and immense advances men made in anatomy and physiology, and in the healing arts which rest on them, when students began to draw their knowledge of man's physical frame directly from human subjects, and not indirectly and incorrectly from the study of animals. A similar advance might be expected in preventive and curative medicine could the action of disease be directly studied in human subjects over which the observer should have absolute control.

Our suggestion would therefore be that such a portion of the criminals convicted from day to day, as might be found available, should be turned over to boards of surgeons and physicians, duly appointed, under whom they might be used for the investigation of sanitary problems, for the good of humanity.

For example, men convicted of capital crimes, instead of being uselessly hanged, might be employed in the study of diseases usually fatal, or of other diseases whose effects in their various stages would need to be studied anatomically. Especially atrocious murderers might be reserved for cases involving vivisection. Criminals of lower grades could be utilized in the study of diseases of minor severity, according to their physical adaptation and the nature of their crime. Having their subjects under absolute control from the inception of a disease to its termination, the investigator could not fail in time to arrive at certain knowledge both as to its prevention and mitigation, if not its cure. Medicine is full of problems whose solution might be greatly hastened by such means.

The same may be said of other departments of social science. How far, for example, is the criminal diathesis curable, and under what conditions? What is the comparative influence of the different sorts of mental and moral training? How can the taint of hereditary crime be averted? How are the various grades of criminality affected by surgical operations, especially those calculated to make the perpetuation of hereditary crime impossible? And how far may the subjects of such treatment be safely allowed at large?

But the field of investigation is limitless. The possible advantages of its systematic prosecution are correspondingly great. The right of society to defend itself against its internal enemies, even to the taking of life, is unquestioned. To attempt it by means of punishment has proved unavailing and costly. It is time that a different plan be tried. Suppose we sink the idea of retribution—if need be, of reformation also—and seek to make all human vermin first harmless, then useful, either by their productive labor or by their subjective contributions to human knowledge for the protection of health and the saving of life.

As for its deterrent effect, such a passionless, unvindictive, business-like treatment of all violaters of the common weal certainly could not be less efficient than the jumble of uncertainty, vengeance, softness, retribution, sentimentality, and uselessness, which constitutes our present judicial and correctional systems. We are disposed to think that the possibility of being made a subject for the study of small pox, cholera, typhoid fever, or even a bout at measles or the mumps, would restrain a pickpocket or a burglar quite as efficiently as the chance of a few weeks on the Island, or a few months at Sing Sing. At least the knowledge gained by means of him and others like him would go far to recompense society for all it might suffer from his depredations.

HOW FAR WILL BODIES SINK IN THE OCEAN?

The often repeated inquiries which we receive, as to the depth in the ocean at which heavy bodies will float, prove the great prevalence of the error that water is so compressible as to become at certain great depths considerably heavier, by its own superincumbent weight. The fact is that, on the contrary, water is one of the least compressible bodies, so that, under a pressure of 7,200 lbs. per square inch, corresponding to a depth of 16,800 feet, or 3 miles, its bulk is only diminished from 1,000 to 978 parts, and its weight or specific gravity increased from 1·000 to 1·022. At double this pressure, or 33,600 lbs. per square inch, at 6 miles in depth, the compression is double that amount.

Oerstedt of Copenhagen, who in 1819 discovered the relation between electricity and magnetism, a discovery which was the first step in the invention of the modern telegraph, was the first who practically demonstrated and measured the amount of compressibility of water and other liquids, by means of an apparatus still named after him. It consists of a small hydraulic press, of which the piston is pressed powerfully down by means of a screw, so as readily to produce pressures of 500, 1,000, and even 5,000 and more pounds per square inch. The walls, being of extremely strong glass, give opportunity to observe the instruments of measurement enclosed. Experiments with this apparatus show data which may be tabulated thus:

TABLE OF THE DEPTH AND CORRESPONDING PRESSURE AND DENSITY UNDER THE OCEAN'S SURFACE.

Depth below surface.	Pressure of water column in lbs.	Pressure of water column in atmospheres.	Density of the water.	Bulk of equal weight of water.
0	0	0	0·0000	1·000000
32 feet	15	1	0·0990	1·000048
160 "	75	5	0·9997	1·00023
1,000 "	750	50	0 9977	1 0023
½ mile	1200	80	0 9963	1·0037
1 "	2400	160	0 9926	1·0074
1 ½ miles	3600	240	0·9892	1·0111
2 "	1300	320	0·9854	1·0148
3 "	7200	480	0·9782	1·0222
4 "	9600	640	0·9718	1·0296
5 "	12000	800	0 9652	1 036
6 "	144000	960	0·9578	1·044

It will be seen from this table, of which the data are perfectly reliable, having been verified over and over again by various experimenters, that when water is submitted to a pressure of 144,000 lbs. to the square inch, corresponding to a depth of 6 miles, a bulk of 1,000 cubic inches will only be compressed to a space of 957 cubic inches, and the specific gravity increased to 1·044, water being 1 000.

Therefore, if a body be capable of floating at such a depth, it must satisfy two conditions: 1. Its specific gravity must be between 1·000 and 1·044. If the specific gravity is not more than 1·000, it will not sink at all; and if it be 1·044 or above, it will sink to any bottom less than 6 miles deep. 2. The sinking body must be less compressible than water; if it is more compressible, it will grow comparatively heavier all the time it is descending, and can never find a stratum of the same weight, in which it might float in equilibrium. Now all the bodies known to be less compressible than water are much heavier than the limit given; such are stones, metals, etc.; and the amount of their compressibility, as compared with that of water, is still problematic. But they will certainly all sink to the very bottom of an ocean, be it ever so deep. In regard to the bodies of which the specific gravity surpasses that of water slightly, so as to come within the range under discussion, they are all very compressible. All kinds of wood, when submitted to great pressure, so that all pores are filled, attain the specific gravity of the primitive wood fiber, the lignin, of which the specific gravity is 1·400; and they will thus sink to the very bottom, like water-logged wood. So it is with all similar substances; and the theory that there is a certain depth in which all or many bodies may float in the ocean must be modified to a statement that there are various depths at which certain various bodies may be kept floating; but that the cases are extremely rare, exceptional, and perhaps only temporary, so that all bodies will finally either sink or float. In the latter case, the destructive power of the elements will soon dispose of them; in the former they are usually preserved, as is seen in observing the structure of the diatoms, those delicate beings the details of which serve now to test our best microscopes, and which the depth of the ocean has preserved, in the mud deposited there, for thousands of years.