

Hydrogen Peroxide.

This pure concentrated body is perfectly colorless, transparent like water, but a little less volatile; it has a peculiar smell, will not freeze, and is decomposed at ordinary temperatures, and by a great variety of bodies. It dissolves readily in water, and this dilute solution may be kept for months; a little hydrochloric acid renders it still more stable, while stronger sulphuric acid effects decomposition into water and oxygen. The chemical action of this body is most singular. Chemists generally distinguish between reducing agents, which deprive other bodies of their oxygen in order to become themselves oxidized, and oxidizing agents, which give off oxygen and oxidize other bodies. Hydrogen peroxide fills both functions, and the action is often so energetic that explosions occur. Spongy platinum, gold, and silver instantaneously decompose it into water and oxygen, while they themselves remain unchanged; several organic bodies, blood fibrin, and animal albumen act in a similar manner. Certain oxides and peroxides are reduced, the metal itself, or at least a combination less rich in oxygen, being formed.

Other bodies, on the contrary, and metals, like iron, are oxidized, arsenious and sulphurous acids being transformed into arsenic and sulphuric acid, while, strangely enough, phosphorus, so easily oxidized, is not attacked at all, and blue indigo sometimes, under certain circumstances, is reduced to white indigo, and the latter reoxidized to its original state. Hydrogen peroxide thus forms one of the strongest reducing as well as oxidizing agents, and its effects in the latter capacity are entirely similar to those of ozone. In fact, of the various tests that have been proposed by Schoenbein, Houzeau, and others, for the determination of ozone, there is hardly one which might not work as well in the presence of small quantities of hydrogen peroxide; and whether the air in general, or at particular periods, contains either one or the other of these bodies, or both together, is by no means certain. The concentrated hydrogen peroxide itself, however, cannot be mistaken. Some years ago, great hopes existed as to its value as a bleaching agent; further researches, however, made its usefulness in this capacity very doubtful. There was a somewhat large demand for it at one time for bleaching hair, and Thénard introduced it as an effectual means of restoring pictures, the lead paints of which had suffered under the influence of a sulphureted atmosphere; but it is as yet much too expensive to be largely used.

GABERT'S UNIVERSAL EXCAVATOR.

This machine is adapted for the mechanical excavation of any trench or ditch whatever by attacking the earth from below. In certain cases it is capable of rendering great services, because it permits of digging out the earth in front and throwing it out behind into cars running on the very same rails that it does. The apparatus consists of two very distinct parts to wit:

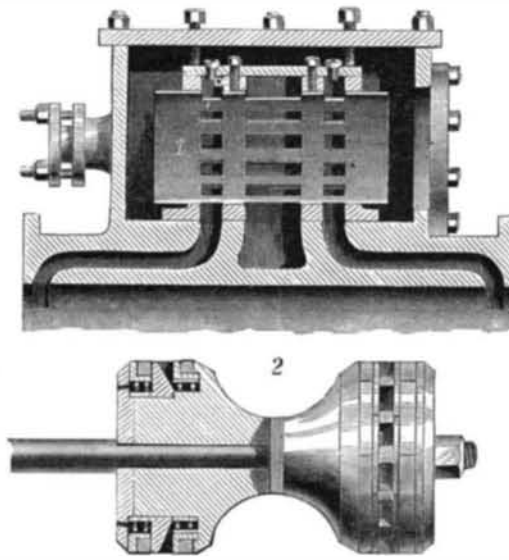
1. The truck, or lower part, which rests, by means of bearings, against the collars of the axles, and which carries the small engine that causes the backward, forward, and rotary motions, and likewise the rollers on which rests the movable crane serving as a base to the whole upper part of the apparatus.

2. The upper and pivoting part of the excavator, which includes the principal engine with its boiler, the dredging chain, the chute, and the bucket frame and its windlass. This pivoting part can be given a fan motion during the excavating, thus permitting the apparatus to dig up the ground in front of it to the width desired. The bucket frame may even be placed in a position perpendicular to the

in a longer bucket frame and a dredging chain like that of M. Couvreux, the apparatus will work in a downward direction from the track. It is this faculty of adapting itself to all the positions demanded in practice that has given the apparatus its name of Universal Excavator. Two of these machines are already operating in France, and giving excellent results. Several others are being constructed either for France or the Isthmus of Panama.—*Annales des Travaux Publics.*

IMPROVED PISTON VALVE.

The advantages gained by the use of a balanced valve are undisputed; but the construction of a perfectly balanced valve possessed of the qualities of durability and perfect



PRELPS' STEAM PISTON VALVE.

action under all conditions, is a matter of difficulty, and has been the subject of a great deal of experiment. We give an engraving of a recently patented balanced steam piston valve, which has proved itself thoroughly practicable in actual use, and in tests on locomotive and stationary engines has, during continued use, shown a marked economy in the use of steam, as well as in the matter of repairs.

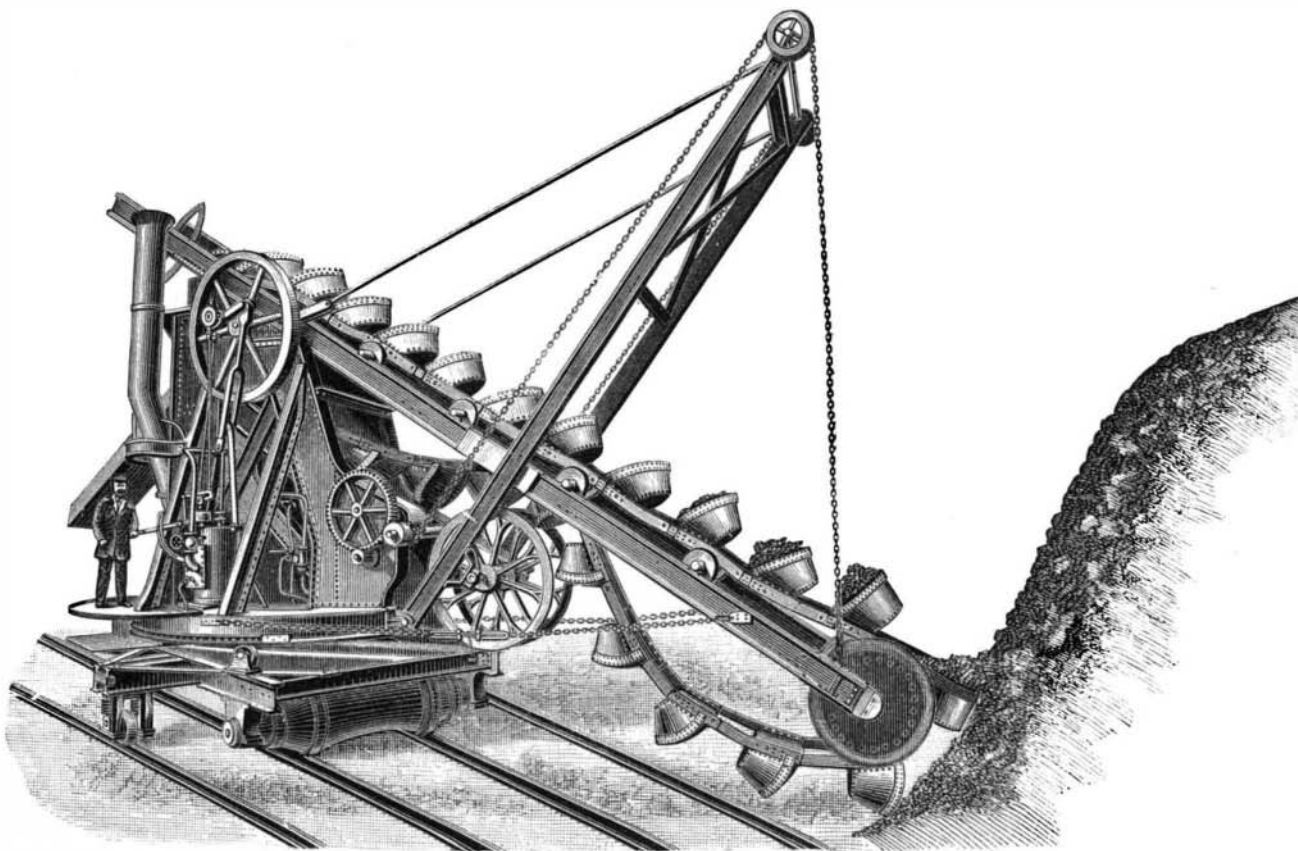
A valve case or shell is secured to the cylinder over the ordinary supply and exhaust ports, and is provided with passages corresponding with the ports. A hollow cylinder passes longitudinally through the shell, and is provided with apertures opening into the passages of the shell. The piston valve is fitted to the hollow cylinder and connected with the valve rod. The valve in its general construction consists of heads separated by an annular groove or exhaust steamway. The heads are packed to fit the cylinder steam-tight, so as

securely. There are two compression rings and packing rings in each head, separated by a follower ring, which is grooved radially on the sides toward the middle of the piston. Between the inner ring and the sleeve on which it is placed is a space connecting with the grooves in the follower ring, so as to admit steam behind the compression ring; the space contains a coiled spring, for retaining the parts concentric. The outer compression ring receives steam behind it directly through holes in the outside washer, or follower. These rings serve to prevent leakage while the piston is passing the ports. The follower rings cut off the live steam from passing behind the inner compression rings, so that while the outer rings are expanded by steam under boiler pressure the inner rings receive behind them steam or hot gases at the cylinder pressure. The effect is to relieve the pressure in the cylinder to a certain extent before the exhaust opens, and thus relieve the valve of the excessive upward pressure at the exhaust end, which in ordinary slide valves often lifts them from their seat. Any excess of pressure is relieved by the small valves opening into the steam chest from the ports. This valve has been applied to a locomotive formerly operated by the ordinary slide valve, showing a great saving in the use of steam and an increased mileage. It may readily be applied to all engines having the common slide valve. In the cut the valve is separated from its casing. This invention has been patented by Mr. Walter S. Phelps, of Wortendyke, N. J.

The Senses of Bees.

Sir John Lubbock lately read to the members of the Linnæan Society an account of his further observations on the habits of insects, made during the past year. The two queen ants which have lived with him since 1874, and which are now, therefore, no less than eight years old, are still alive, and laid eggs last summer as usual. His oldest workers are seven years old. Dr. Müller, in a recent review, had courteously criticised his experiments on the color sense of bees; but Sir John Lubbock pointed out that he had anticipated the objections suggested by Dr. Müller, and had guarded against the supposed source of error. The difference was, moreover, not one of principle, nor does Dr. Müller question the main conclusions arrived at or doubt the preference of bees for blue, which, indeed, is strongly indicated by his own observations on flowers. Sir John also recorded some further experiments with reference to the power of hearing. Some bees were trained to come to honey which was placed on a musical box on the lawn close to a window. The musical box was kept going for several hours a day for a fortnight. It was then brought into the house and placed out of sight, but at the open window, and only about seven yards from where it had been before. The bees, however, did not find the honey, though when it was once shown them they came to it readily enough. Other experiments with a microphone were without results. Every one knows that bees when swarming are popularly, and have been ever since the time of Aristotle, supposed to be influenced

by clanging kettles, etc. Experienced apiarists are now disposed to doubt whether the noise has really any effect; but Sir John suggests that even if it has, with reference to which he expressed no opinion, it is possible that what the bees hear are not the loud, low sounds, but the higher overtones at the verge of or beyond our range of hearing. As regards the industry of wasps, he timed a bee and a wasp, for each of which he provided a store of honey, and he found that the wasp began earlier in the morning (at four A. M.), and worked on later in the day. He did not, however, quote this as proving greater industry on the part of the wasp, as it might be that they



IMPROVED UNIVERSAL EXCAVATOR.

tracks, if it be desired to work in widening as with ordinary excavators. A double spring placed at the upper part of the bucket frame permits it to rise parallel with its axis whenever an insurmountable obstacle, such as a large stone, tree trunk, etc., presents itself under the buckets. Under the impulse of this same spring the frame again descends, and the following bucket attacks the obstacle in its turn until it gives way and falls into the buckets. The application of this spring prevents breakages in the mechanism when the resistance of the earth is abnormal. On putting

to prevent leakage of steam into the exhaust space, and the reciprocation of the valve connects the openings in the cylinder and casing and the supply ports with the central opening of the valve and the exhaust port, first at one end and then at the other. The piston heads are made up of beveled collars on the rod, by which the exhaust is made adjustable. The collars have sleeves that receive split compression rings carrying packing rings which are held between the collars forming the central portion of the valve and outside washers. A nut at the outer end of the valve rod retains the parts

are less sensitive to cold. Moreover, though the bee's proboscis is admirably adapted to extract honey from tubular flowers, when the honey is exposed, as in this case, the wasp appears able to swallow it more rapidly. This wasp began work at 4 A. M., and went on without any rest or intermission till 7:45 P. M., during which time she paid Sir John one hundred and sixteen visits.

THE sum of \$3,650,000 is now invested in the manufacture of iron in the Birmingham, Ala., district.