

tion correctly. There was an adequate remedy at law, and if it was slow it was the fault of the officers of the law. But it was not slow when the highest magistrate in the land swept aside the incompetent and traitorous gang of local bailiffs, and put an end to rioting with even less than a "whiff of grape-shot" by the prompt discharge of his constitutional duty. The remedy at law, for such it may properly be called (the troops of the United States being really peace officers), was quick and it was adequate. It may be doubted whether the injunctions were not wholly superfluous.

But granting that, it may be said, were they not at least harmless? We apprehend not. Our readers do not require to be told that we regarded the aims of the strikers at Chicago as hopeless and their methods as wicked and criminal. We do not forget, however, that these men are our fellow-citizens, or impute to them as a body any exceptional depravity. It is in the highest degree important that the very poorest member of the community should possess unshaken confidence in the integrity of our judges and the impartiality of the administration of justice. We fear that many of the common people, especially in the Western States, entertain the belief that the courts have allied themselves with the great corporate interests of the country, and it is eminently desirable that this belief should have no sound basis. It is the duty of the courts to defend rights of property, and upon this account they incur a certain degree of unpopularity with those who have few such rights to defend. But every effort should be made to escape this odium by exhibiting the strictest impartiality, and there is reason for contending that this caution has been disregarded in the recent injunctions. Upon their face they indicate the purpose of causing the arrest and punishment of citizens, without trial by jury, for offences for which criminal jurisprudence provides that right. If there is no other way of repressing crime except by treating it as contempt of court, our jurisprudence must be reconstituted upon models that have more likeness to those which prevail under despotic governments.

MORE POLICE CORRUPTION.

MR. GOFF made it very plain at the first session of the resumed Senate inquiry that he had by no means exhausted the field of police incompetence and depravity. Indeed, the depths which he sounded on Monday were a little lower than any that he had touched heretofore. He began with that branch of the service which Superintendent Byrnes singled out in his recent letter to the Police Board as the one especially entitled to commendation, the Detective

Bureau. Mr. Byrnes said of this bureau that since its reorganization in 1880 it has "reached such a high standard of efficiency and discipline as has not been equalled by any other detective bureau in the world." Yet Mr. Goff shows by the mouth of one of the chief officials of that bureau that he is either totally ignorant of the law governing his conduct in a most important branch of his duty, or wilfully guilty of systematic violation of the law.

The way in which Mr. Goff brought out this fact was a striking illustration of his skill in such matters. He showed that it is customary for the Police Department to send out postal-cards to pawnbrokers describing stolen property, and pledging on behalf of the owners of such property payment of the money which may have been advanced on it to the thieves who have brought it to the pawn-shops; that detectives habitually advise persons whose property has been stolen to pay the money which has been advanced on it, and that detectives not infrequently receive a share of the money thus paid over. Sergeant Hanley, who admits these things, and admits also that in one case he received \$17 for his services, confesses that he had often heard judges in the Court of General Sessions declare that stolen property belongs to the owner and may be recovered wherever found, but denies that he knows that a detective has the right to go into any pawnshop in the city, seize stolen property which is identified by the owner, and pass it over to the latter without charge. This is an extraordinary state of mind for an official of the best detective bureau in the world to manifest. The picture which he presents of the method pursued by that bureau makes it an ally with the thieves and pawnbrokers against the citizen whose property has been stolen. There is no other interpretation to be put upon Sergeant Hanley's testimony.

After Sergeant Hanley came another witness whose testimony was scarcely less startling, though it was not in a new field. Another green-goods operator was produced who supplemented the testimony of the witness Appo, given several weeks ago, in regard to the payments made to the police for the protection of the operators of this swindle. Applegate, the latest witness, gave a very straightforward and circumstantial account of the way the green-goods business had been carried on in two police precincts presided over by Capt. Meakim, saying that when the captain was transferred from a downtown precinct to one in Harlem, the business was transferred with him, and was carried on without molestation in both localities because of the payment of \$50 a month to the captain. He sustained his testimony with much cir-

cumstantial evidence, and Mr. Goff sustained it with some printed circulars, and used these with much dramatic effect to convict the printer of them of perjury when he was put upon the stand. Incidentally, evidence was adduced to show that the chief green-goods operator, McNally, was on very friendly terms with Sergeant Hanley of the Detective Bureau.

Taken altogether, Monday's evidence is of the first importance, perhaps of greater importance than any that has preceded it. It shows that there is no branch of the police service that is not thoroughly rotten, and strengthens the already strong conviction that there is no radical remedy for that service save its complete abolition and reconstruction on new lines. Mayor Gilroy's complacent observations, which he put forth with such impudent assurance on the following morning, were not well timed. He should have waited till he had read Mr. Goff's new testimony before he took the position that, in removing certain police captains after Mr. Goff had proved their guilt, the police commissioners have vindicated themselves and exonerated Tammany Hall. Now he will see that the police commissioners have still further work to do before the vindication will be complete, and that by the time they shall have succeeded in getting all the corrupt men out of the Police Department, there will be a very small force of officials left therein.

It is within the bounds of probability also that the police commissioners themselves may be on trial before the inquiry is ended, if it can be maintained by anybody that they have not been on trial since the beginning of the inquiry. Whose system is it that is found to be so saturated with corruption? Who has been administering the affairs of the Police Department for the past quarter of a century? Tammany men, either avowed or disguised. Nearly all of them have been appointed by Tammany mayors. All this corruption has been in existence under their noses in their own department, and they never suspected it until Mr. Goff showed it to them. What a charming lot of innocents they have been! And what a charming innocent the mayor is when he comes before the public and points with pride to their virtue, Tammany's virtue, in getting rid of the blackmailers, after they have been exposed! "We never allow thieves and blackmailers to stay in office after they have been shown up!" This is the Tammany platform upon which the Tammany mayor proposes to go before the people in the coming election.

HELMHOLTZ.

DR. HERMANN HELMHOLTZ, as his contemporaries have called him, the acknowledged

and worshipped head of the scientific guild, is gone. He was born on August 31, 1821, at Potsdam, where his father was professor of the gymnasium. His mother's maiden name was Caroline Penn; she came of a branch of that family settled in Germany since the religious troubles in England. From childhood Hermann had a passion for science; but the nineteenth century came near missing this great light, for the circumstances of the family were such that no road to science was open to him except that of studying medicine in the Military Institute of Berlin. He took his degree of M.D. in 1842, and his inaugural dissertation, the only Latin publication of his life, related to the nervous systems of invertebrate animals. He was at once attached to the service of charity, and began without delay to study putrefaction, upon which in 1843 he published a memoir maintaining its purely chemical nature—an opinion subsequently surrendered. He soon returned to Potsdam a surgeon in the army. In 1845 he was employed with good reason to write articles on animal heat in a medical encyclopædia of high character, and in the yearly report upon the progress of physics. The same year he printed an original investigation of the waste of substance of a muscle in action.

After that, for about two years, he produced nothing. It was one of those periods of seeming idleness to which the most productive geniuses are subject, and which afford mediocrity matter for carping. Other young scientists filled the journals of 1846 with the records of their industry, but not one syllable came from Helmholtz. He was not heard from until 1847, and not till July 23, when he read a paper before the Physical Society of Berlin. This paper was entitled "The Conservation of Force." In the judgment of many of those who have examined the matter, it was the epoch-making work from which alone the greatest scientific discovery that man has ever made must date. Certainly it was the argument which produced the intense conviction with which the world has held that doctrine ever since. It is fair to say that other excellent critics, and Helmholtz himself among them, award the merit of the first enunciation of the great law to Robert Mayer, who, in 1842, had published a paper which attracted no attention whatever, and of which Helmholtz in 1847 was as little aware as the rest of the world. But, in any case, there is no doubt that Helmholtz was the first to conceive the proposition from the point of view which made it so attractive to all accurate thinkers and so wonderfully fecund in new truth.

According to his statement, nothing exists in the outer world but matter. Matter in itself (*an sich*) is capable of no alteration but motion in space, and these motions are modified only by fixed attractions and repulsions, and this is true everywhere, even in the actions of animals and men. It was an amazingly bold assertion, utterly opposed to almost every kind of philosophy, certainly to Kantian and all post-Kantian idealism, as well as to the nominalistic idealism of the English school, which such writers as Ernst Mach have taken up. But the implicit faith with which it has been received is a singular psychological phenomenon, for the theory that all human actions are subjected to a law having no teleological character, when we know (or seem to know) that our actions are adjusted to purposes, has obvious difficulties; and the experimental evidence of the correctness of the law as applied to animal physiology is very slender. Indeed, some of the most careful re-

searches (as those of Fick and Wislicenus) have led to results directly opposed to it. Yet the physiologists, one and all—the judicious Michael Foster, for example—simply treat those results as absurd. In this aspect Helmholtz's great doctrine appears as the pet *petitio principii* of our time. Its truth was unquestionable, in the only sense in which anything based on induction can rationally be admitted as true, namely, its close approximation to exactitude. Nobody can deny that it is at once the crown and the key of physical science. In that memoir, by the way, Helmholtz first displayed his facility in applying the calculus to unaccustomed problems—a facility very surprising in a man of twenty-six whose studies had been supposed to lie in the direction of anatomy and physiology. Surely, in the company at that memorable meeting of the Physical Society there must have been some who were able to discern that they were in the presence of one of the most stupendous intellects that the human race had yet produced.

Of course, a reward was due from organized humanity to the man who had thus lifted man's mind to a higher vantage ground. And this reward came, for the next year he was created no less than assistant in the Anatomical Museum of Berlin. He now began to occupy himself with the physiology of hearing. In 1849 he was appointed supplementary (or extraordinary) professor of physiology in the University of Königsberg (without salary), and in 1850, on July 19, he communicated to the Physical Society of Berlin an elaborate memoir breaking ground in the interesting field of the measurement of the duration of nerve-actions. In 1851 he invented the ophthalmoscope, for which many and many a human being has owed him his eyesight. This year he began an original study of electro-dynamics. In 1852 he was promoted to a regular chair in the university. His discourse upon his installation dealt with peripheral sensations in general, especially those of sight and hearing. It was a comparison of the relation existing between the vibrations that excite a given sense, and those existing between the sensations themselves. We remark that while the memoir on the Conservation of Force fairly bristled with repetitions of the philosophical phrase *an sich*, "in itself," it is in this discourse carefully avoided. It would seem that something must have happened in the interval which made Helmholtz dread "*an sich*" as a burnt child dreads fire. In this paper, such ingenuity is used to avoid it that but once does it slip in, and then in a negative phrase. But since the idea was there, we cannot praise Helmholtz for not giving it its proper dress.

In giving the substance of his lecture, we need not imitate his circumlocutions to avoid this natural phrase. His point was this: vibration-systems essentially different give rise to precisely the same color-sensations. There are three fundamental color-sensations, which, being mingled in different amounts, give rise to all others; but there is nothing corresponding to this tri-dimensionality in the vibrations themselves. On the contrary, the sensations of a color-blind person for whom one of the three fundamental sensations is non-existent, much better correspond with the facts in themselves. Sounds, on the whole, correspond more accurately to the vibrations. But, to the ear, the difference between one rate of vibration and another is hardly perceptible until two different sounds are compared. If a melody is transposed to another key, the effect is nearly the same; but a painter who should transpose

red to yellow, yellow to green, green to blue, and blue to violet, would make a nightmare of his painting. These are certainly striking facts; but still more interesting is it to note what lesson it was that this typical nineteenth-century understanding drew from them. Other minds as clear as his might have read here the incommensurability between mind and matter, and have found a refutation of materialism in the circumstance that mind here acts as matter could not do. But the conclusion of Helmholtz is that the sense-qualities distinguish the things in themselves about as well and about as arbitrarily as the names Henry, Charles, and John parcel out human kind.

Besides this "Habilitationsvortrag," a "Habilitationsschrift" was expected from the new professor, and this last set forth his theory of the mixture of colors. It was, at bottom, the doctrine of Dr. Thomas Young; and only the careful comparison with observation, and the application of it to explain effects of mixing pigments and the like, were new. In 1854 he attended the meeting of the British Association at Hull, and there read a fuller account of his theory of colors, which no doubt induced Maxwell to take up this study, who soon made it even more lucid and beautiful than Helmholtz had done. In 1855 he became professor of physiology at Bonn. In 1856 he began the publication of his great treatise on physiological optics, which was not completed till ten years later. On May 22 of the same year, he announced to the Berlin Academy his discovery of combinational tones, which are musical sounds resulting from the interferences of the vibrations making two other sounds.

In 1858 he became professor in Heidelberg, at that time the ultimate goal of a German professor's ambition; and in the same year he astonished the mathematical world by his great memoir on eddies, or vortices, a matter of fundamental importance in hydrodynamics. It was a very great and fruitful idea which he there advanced, and which he wonderfully developed. Much has already come from it, but its full harvest yet remains to be gathered in. No mathematician will dispute that this was a work only second in importance to the cataclysmic essay on the Conservation of Force. During the next two years Helmholtz's acoustical researches were very prolific, and at the same time he published remarkable papers upon color-blindness and upon the contrasts of colors. In 1860, on April 12, he read to the Vienna Academy a paper giving measurements by his pupil, Von Pietrowski, of the viscosity of fluids, with a mathematical discussion by himself. Although the subject was not quite new, Stokes's masterly work dating from 1851, still Maxwell's researches were not yet begun, and this memoir constituted another important contribution to hydrodynamics and to the general conception of matter. Helmholtz himself very soon began to apply these ideas in acoustics.

We next find him engaged upon the difficult problem of the horopter and the motions of the eye. One of the next subjects to engage his attention was the musical note which is emitted from a strongly contracted muscle. In 1862 appeared his great work on Sensations of Sound and the theory of music, and with it the main work of his life was accomplished. Since that time he has indeed produced enough to make another man famous; it is little in comparison with his earlier achievements. He has written, for example, papers upon the facts underlying geometry which were sub-

stantially anticipated by Riemann's great work, with which Helmholtz would seem not to have been acquainted. To produce independently that which was the proudest laurel of one of the most original mathematicians of the ages was a great feat, but it was needless. There were also a series of memoirs in which Helmholtz discusses all the principal systems of formulae which have been proposed by different physicists as laws of electrodynamics. He gave the first mathematical explanation of the formation of ordinary waves upon water—an explanation which not only enables us to see why certain forms of waves which might exist are not produced in nature, but also throws much light on other subjects. In 1871, he was appointed professor of physics, no longer of physiology, in the University of Berlin. Twenty years later he was made president and director of the Physikalisch-Technische Reichsanstalt, a foundation under the control of the Imperial Department of the Interior, for the experimental furthering of exact natural inquiry and the techniques of precision.

Not the slightest allusion to any moral or religious problem ever dropped from the pen of Helmholtz. Though no reference to Hegel or Hegelianism appears in his pages, he more than any other namable person caused the downfall of that kind of speculation in Germany, and brought in the present admiration for the English style of philosophizing which his own so much resembled. The temper of the man was admirable. He never indulged in one of those reclamations of priority into which scientific vanity is sure to be betrayed, but several times published notes to show that his own results were not so new as he and the scientific world had believed them to be. He did much to bring into notice the works of other physicists, among them the Americans Rowland and Rood (his visit last year to this country is freshly remembered). He found himself several times engaged in controversies with redoubtable antagonists, Clausius, Bertrand, perhaps we may so reckon Land. In every case he so conducted himself as to bespeak an imperious desire to find out the truth and to publish it; and every approach to personality was avoided or flung away from him as a pestilential infection. The world owes much to the intellectual clearness and integrity of Hermann Helmholtz, M.D.

VOX POPULI IN SWITZERLAND.

BERN, July, 1894.

To outward appearance, Switzerland is an atoll in the surging ocean of European politics. Here the increasing strain which has come upon the representative institutions of other countries is hardly felt. Here the Legislature is free from party organization, the business of the country is well and promptly done, the people are content with their representatives. Here, also, we are paradoxically assured, such statutes as do not commend themselves to the popular will may be revised by the Referendum; and reforms ignored by the Federal Assembly may be framed and enacted through the Initiative. These two ingenious applications of pure democracy to large communities are urged upon Americans because so successful in Switzerland. There has long lain in my mind a suspicion of a device which assumes to relieve men from the results of their failure to choose representatives who really represent them; and this incredulity has not been removed by staying in Switzerland and

looking into the practical working of the much-lauded system. Fortunately there is a body of material on the subject: besides the messages sent in by the Executive Council after each popular vote, there is an official report of 1892 summarizing the statistics since 1848; and I am much indebted to several Swiss statesmen and publicists for frank and suggestive discussion.

No criticism of the referendum can be worth while which does not take account of the difference of political conditions in the United States and in Switzerland. In size, population, and wealth the latter country is very like an American State, say Massachusetts; the six hundred and eighty thousand voters are distributed in a compact land, with excellent election machinery. The cantons, unlike the commonwealths in America, are steadily losing ground to the federal Government, and the Swiss Senate, the Council of States, has less power and prestige than the elective National Council. The legislative practice of the two countries is also different: few bills are presented to the federal Assembly, and very few are enacted, so that in 1891 but fourteen general laws were put upon the statute-book. The Executive Council, though without a veto, has an important part in legislation: it legislates for itself in many matters of detail; and on larger affairs prepares and submits bills which the Assembly frequently enacts without change. This preparation of legislative material by the executive is a tradition in the cantons as well as in the Swiss union. The Diet took this function on itself under the old Confederation, and, indeed, the word "referendum" was originally applied to the process of referring measures back from the Diet to the cantons; it was too often a political "how-to-do-it." The present referendum is, therefore, practically a check both on the Executive and the Legislature, and can easily be invoked on a considerable proportion of all general statutes. To apply it to acts which have already run the gauntlet of an executive veto, and have found a place in the obese statute-book of an American commonwealth, is a different matter. Nor is it so easy in Switzerland to crystallize the opinion of the Assembly into concrete measures, since the lively sectional and religious rivalries of the country are not expressed in well-organized parties. Conventions and caucuses with us take the place which the initiative is meant to fill in Switzerland. So different are all the conditions in the two countries that the success of the referendum in the one does not at all imply that it would work well in the other; while if the referendum has disappointed its friends in Switzerland, where it harmonizes with other institutions, it is not likely to succeed in the United States. And whatever might be done in the States, a national referendum would nullify the Senate, and hence be a complete change in the American system of government and probably a national misfortune.

A judgment of the referendum must be based on the working of the electoral machinery, on the interest shown by the voters, and on the popular discrimination between good and bad measures. The process of invoking and voting on a referendum is simple and easily worked, if not used too often. Although the Assembly has, in urgent cases, the constitutional right to set a resolution in force at once, it always allows from three to eight months' delay so as to permit the opponents of a measure to lodge their protests against it. Voluntary committees take charge of the movement, and, if a law is unpopular,

little difficulty is found in getting together the necessary thirty thousand or fifty thousand signatures. Only thrice has the effort failed when made. When, as in 1892, the signatures run up to 180,000, the labor is severe, for every signature is examined by the national executive to see whether it is attested as the sign manual of a voter; sometimes, in an interested canton, as many as 70 per cent. of the voters have signed the demand. The system undoubtedly leads to public discussion: newspapers criticize; addresses and counter addresses are issued; cantonal councils publicly advise voters; and of late the federal Assembly sends out manifestoes against pending initiatives. The federal Executive Council distributes to the cantons enough copies of the proposed measure, so that one may be given to each voter. The count of the votes is made by the Executive Council as a returning-board. Inasmuch as the Swiss are unfamiliar with election frauds, and there has been but one very close vote in the national referendum, the count is not difficult, but there are always irregularities, especially where more than one question is presented to the voters at the same time.

What is the effect of the popular votes, thus carried out? The following table, based on official documents, shows the results for the twenty years, 1875-1894:

	Passed.	Rejected.	Total.
(a.) Constitutional amendments proposed by the Assembly (referendum obligatory)	1	0	1
(b.) Constitutional amendments proposed by popular initiative (50,000 signatures)	2	1	3
(c.) Laws passed by the Assembly (referendum demanded by 30,000)	14	4	20
	17	13	31

* One measure still pending.

Making allowances for cases where more than one question has been submitted at the same time, there have been twenty-four popular votes in twenty years. In addition, most of the cantons have their own local referenda; in Zurich, for example, in these twenty years, more than one hundred other questions have been placed before the sovereign people. These numbers are large in themselves, but surprising in proportion to the total legislation. Out of 158 general acts passed by the federal Assembly from 1874 to 1892, 27 were subjected to the referendum; that is, about one-sixth are reviewed and about one-tenth are reversed. Constitutional amendments usually get through sooner or later, but more than two-thirds of the statutes attacked are annulled. To apply the system on such a scale in any State of our Union is plainly impossible; thirty-nine-fortieths of the statute-book must still rest, as now, on the character of the legislators.

Nevertheless it may be worth while to excise the other fortieth, if experience shows that the people are more interested and wiser than their representatives, when a question is put plainly and simply before them. I must own to disappointment over the use made by the Swiss of their envied opportunity. On the twenty referenda between 1879 and 1891 the average vote in proportion to the voters was but 53.5 per cent.; in only one case did it reach 67 per cent.; and in one case—the patent law of 1887—it fell to about 40 per cent. in the Confederation, and to 9 per cent. in