similar change is noted in the other, though it may be less marked. These facts would argue that there is probably a free exchange, through the placenta, of the substances that enter into the reaction of coagulation. This, in turn, shows why the hemorrhages of the newborn rarely, if ever, occur on the first day of life, but are usually seen about the fourth day.

Postpartum hemorrhages have been observed clinically much more frequently in patients who have been under ether anesthesia than in patients who have not

TABLE 5.—COMPARISON OF MATERNAL AND FETAL BLOOD

Blood	Case	Coagulation, Minutes	Calcium, Minutes	Prothrombin, Minutes
Maternal.....	1	3	2.5	4
Fetal.....	1	3	3	No good clot
Maternal.....	2	4	4	4
Fetal.....	2	4	2	4
Maternal.....	3	5	6.5	6
Fetal.....	3	3.5	3.5	2
Maternal.....	4	6.5	5.5	4.5
Fetal.....	4	5	5.5	4.5
Maternal.....	5	3.5	4	3.5
Fetal.....	5	6	7	4.5
Maternal.....	6	5	3	3
Fetal.....	6	5.5	4	3
Maternal.....	7	4.5	4	2.5
Fetal.....	7	4.5	4	2
Maternal.....	8	4.5	4	2
Fetal.....	8	4.5	4	2
Maternal.....	9	6	4	4
Fetal.....	9	4	4	4
Maternal.....	10	3	3.5	7
Fetal.....	10	4	3	5

been anesthetized. This factor was observed in all cases, but no differences in the coagulation time could be detected in the two groups. It is probable, therefore, that these hemorrhages are due to relaxation of the uterine muscle bundles, thus releasing the constriction on the uterine vessels.

CONCLUSIONS

1. The coagulability of the blood in women before, during and after labor, as measured by the estimation of the coagulation, calcium and prothrombin time, is well within the limits of normal blood coagulability.

2. Maternal and fetal blood at the time of birth of the baby have practically the same coagulation time.

3. There is no evidence from this series of experiments that pregnancy tends to produce a hemophilic state in the mothers; hence, postpartum hemorrhage can rarely, if ever, be ascribed to this cause.

4. Fetal blood at birth clots with normal firmness and rapidity, so that subsequent hemorrhagic tendencies cannot be detected from coagulation tests at this time.

5. Patients who took ether exhibited the same coagulation time as those delivered without ether. Postpartum hemorrhages, therefore, which are more common in these cases, cannot be explained on the basis of decreased blood coagulability.

Infant Mortality and Prevention in New Zealand.—The result of a study made by the U. S. Department of Labor (children's bureau) shows a close relation between organized infant welfare work and a striking reduction in the number of infant deaths in New Zealand. The New Zealand rate is lower than that of any other country in the world, it is stated. For 1919, the number of deaths of infants under 1 year of age was only 45 to every 1,000 live births, as compared with 87 in the United States birth registration area. The credit for this is due to the work of the Royal New Zealand Society for the Health of Women and Children, organized in 1907. Popular education in "mother-craft" is also promoted, through free distribution of pamphlets; publication in the newspapers of a regular column on "Our Babies," and the natural passing on of information among the women of the society.

BATTERY BURNS

REPORT OF THREE CASES

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There have come under my observation, during the last two years, three cases of burns of the eye and adnexa by sulphuric acid from storage batteries. The burn in itself in each case has presented no clinical features unusual to any acid burn; but the interesting feature has been the manner of production. All of the cases have been in mechanics working on the storage batteries of automobiles, and a few brief facts concerning such batteries would not be amiss.

A storage battery consists of an acid-proof cell, containing alternate plates of lead and zinc and filled with dilute sulphuric acid. The cell has an acid-proof cover, through which three vents lead, two of them closed by the usual electrode connections, while the third is for ventilation and is usually closed by a rubber screw-cap with a pinhole aperture in it. Such a battery is continuously charging or discharging, and is never electrically quiet unless completely inert.

During the process of charging, heat is generated by the resistance of the fluids to the electrical current, and hydrogen is given off by an electrolytic change in the sulphuric acid. When the battery is at an electrically low ebb, the amount of heat and hydrogen given off is very minute; but as the point of electric saturation approaches, the heat increases in amount so that a fully charged battery has a temperature at its point of saturation as high as 140 C. (284 F.). At this point, the hydrogen is given off in such quantities that visible bubbles appear in the battery solution, and the battery is said to be "gassing." And this is the dangerous point. An open flame of any sort, whether it is an electric spark, a blow-torch, or a glowing cigaret, suffices

Batteries in cross-section, with small dead space (A) and large dead space (B, dangerous type).

to ignite the hydrogen that has been mixed with air, and the gases will burn with an almost instantaneous flame. Were this in the open and unconfined, there would be no danger. But the flame occurs within the small air chamber that lies within the battery cell between the upper level of the sulphuric acid and the cover of the cell. Confined within this small space, the rapidity and intensity of the gas flame is sufficient to be regarded as an explosion, exerting tremendous pressure equally in all directions. The sole vent is the aperture for ventilation (and the cap is usually off), and through this are driven the burned and burning gases and quantities of sulphuric acid that lie near the surface.

The force is sufficient to drive the mixture several feet into the air, and woe betide the flesh that lies

within the range of that hot sulphuric acid with its relatively high specific gravity of 1.350. The distance that the mixture is expelled from the cell depends on the amount of hydrogen present, which, in turn, depends on two factors. First, on account of the extreme lightness of hydrogen, the gas escapes from a charging cell fairly rapidly unless the vent hole is too small or even entirely plugged. Therefore the battery must be actually charging for hydrogen to be present in sufficient quantities to be dangerous. Second, if the cell cover is relatively low and the air vent is flush with the inner surface of the cover, the possible quantity of hydrogen is limited. But if the cell cover is high above the surface of the acid and if the air vent projects three-quarters inch through the cover (as is the case in one make of battery), a large dead space is present in which sufficient amounts of hydrogen may accumulate so that the force of the resultant explosion will blow the entire cell cover off, spattering the acid in all directions. The accompanying diagram shows cross-sections of batteries with small dead space and with large dead space (dangerous type). It is scarcely necessary to add that hydrogen alone and in a pure state is noninflammable, and that the admixture of air or oxygen is essential to the production of a flame. But the explosion of such a mixture is of the most violent type, exerting tremendous force.

REPORT OF CASES

CASE 1.—H. S., July 9, 1920, was using a blow-torch to heat a battery connection for a repair job of soldering. The battery had just been "taken off the line," and was fully charged. An explosion occurred, and hot acid was splashed into both eyes. He washed both eyes with tap water immediately, and ten or fifteen minutes later flushed the eyes with a solution of sodium bicarbonate. Since then he had been keeping the conjunctival sacs filled with a neutral ointment.

July 16, the right eye was practically normal except for a slight conjunctival hyperemia. The left eye showed moderate edema of the lids. The tarsal conjunctiva was swollen and hyperemic, and showed several eroded areas, particularly near the outer canthus. The bulbar conjunctiva was intensely edematous and bloodily suffused. Around the limbus, the conjunctiva was very tense and yellow, and appeared continuous with the cornea. The central portion of the cornea was moderately opaque, but was still translucent. The entire periphery of the cornea was cloudy, yellow and swollen above the normal plane. Irregular small erosions of the surface were present. There was one adhesion of the peripheral cornea to the tarsal conjunctiva of the upper lid, which was easily broken. The anterior chamber was moderately deep. The pupil was partially under the effect of atropin. The iris seemed normal. The fundus could not be seen. The tension of the eyeball was slightly below normal. Vision equaled light perception.

The usual local treatment of atropin ointment, mercurchrome-220 soluble, sodium bicarbonate wash, and sterile petrolatum was ordered. The inflammatory reaction gradually subsided with extensive formation of adhesions between the tarsal and bulbar conjunctiva. These adhesions were broken daily, and attempts were made to prevent further formation by the inserting of various kinds of artificial tissues between the lids. The attempts were not successful, however. August 12, the conjunctiva had lost the charred, white appearance, and was now exuberant. The fornices were contracting with scar tissue. The corneal erosions had disappeared, and the peripheral swelling was subsiding. But the opacity of the cornea was increasing and becoming more dense, both centrally and peripherally.

October 29, the exuberant conjunctiva had quieted down and was replaced with smooth scar tissue. There was one firm symblepharon above and one below, both of which were fairly wide. The cornea was entirely opaque, with smooth,

glistening epithelium. Under the slit lamp, the opacity was seen to consist of what seemed to be irregularly round coagulations of the corneal tissue, with dilated lymph spaces and thickened nerve fibers. There was considerable vascularization by fine deep vessels from the scleral limbus. The iris was no longer visible. An attempt was made to cut the adhesions and prevent their recurrence by the implantation of a Thiersch graft, but this was not successful. Therefore, Jan. 26, 1921, the symblepharons were carefully dissected free and egg membrane was sutured in place to prevent the recurrence of the adhesions. This was partially successful.

July 8, 1921, the eye was pale but flushed easily. The conjunctiva was smooth and showed extensive areas of scar tissue. The lower symblepharon was broader than the upper, but neither was sufficiently tight to interfere with ocular motion. The cornea was entirely opaque and was covered with new connective tissue, heavily vascularized from the neighboring limbus. The vision was good light perception and projection. It was not deemed necessary to operate further on the symblepharons.

CASE 2.—L. A., seen in consultation, May 10, 1922, was working on an automobile battery, March 7, when the flame of a blow-torch ignited the free hydrogen, and an explosion occurred. The hot acid was spattered into the right eye. Since then he had had the usual local treatment.

The conjunctiva of the right eye was moderately injected. There was some cicatricial contraction of the scarred lower tarsal conjunctiva and much more of the upper. In the exact center of the upper tarsal conjunctiva was a 4 mm. round nubbin of granulation tissue. The bulbar conjunctiva was slightly drawn over the limbus at the periphery. The corneal epithelium was unbroken. There was a diffuse haze of the corneal tissue well under Bowman's membrane, but there were no defined collections of opaque tissue. It would seem rather that the entire corneal substance was semiopaque. The visible nerve fibers were thickened, and the lymph system was distorted. There was no vascularization visible, even with the slit lamp. The anterior chamber and the iris were normal. The pupil was under the influence of atropin. Fundus details were not visible. The tension of the eyeball was slightly minus. Vision was 0.04.

The left eye showed a slight follicular conjunctivitis, but was otherwise normal except for a slight error of refraction.

CASE 3.—P. W. was removing a fully charged battery from the charging bench, when a live wire short circuited on a terminal, causing a spark in the immediate proximity of the air vent of the battery. An explosion followed, and some hot acid spattered into the right eye. The eye was washed immediately with tap water.

When seen about twelve hours later, July 19, 1922, the left eye was normal. There was some edema of the lids of the right eye. There was moderate swelling of the tarsal conjunctiva, with roughening of the surface. There was considerable mucoid secretion. The bulbar conjunctiva was slightly injected along the palpebral aperture. The cornea, anterior chamber, iris, pupillary action, fundus and tension were normal.

A wash of sodium bicarbonate was ordered to be used every few hours, and an ointment containing an iodoform substitute was instilled after each application of the wash. Within a few days, the inflammatory reaction subsided and left the eyelids in a normal condition without any scar formation.

One of the clinical features of these cases that is difficult to explain is the production of the deeper corneal opacity with little or no disturbance of the corneal epithelium. It is barely possible that the cases came under examination so long after the original injury that any epithelial erosion had had sufficient time to heal completely. But in that case there would have been some visible traces left, none of which were found. It is an open question whether the opacity resulted from the heat of the solution that struck the eye or whether it was due to the chemical action that may occur in the short time that elapses before the

foreign solution is washed away by the tears and the action of the lids. The heat effect would seem the most probable because of the lack of epithelial erosions and because of the clinical picture of seeming albuminoid coagulation as seen with the slit lamp. Were it the chemical action, there would be either epithelial erosions that would be very slow in healing or else marked opacity and distortion of the surface epithelium, probably accompanied by sloughing, a condition that did not exist in any of the cases. A case illustrating this point came under my observation shortly after the Fourth of July of this year. A boy suffered a burn of the eyeball and eyelids from an explosion of a small can of calcium carbide, and it was impossible to tell from the history whether the injury resulted from the flame or from flying particles of the chemical. The cornea presented a condition identical with that seen in the sulphuric acid burns. Had the corneal condition been due to the chemical, small particles, the result of the chemical disintegration in the form of quicklime, would have been found in the cornea or conjunctiva. But the epithelium was intact, and no foreign matter could be detected. With the slit lamp the same coagulation appearance was seen. Consequently it was not possible for the effect to be produced by any other agent than the flame and its heat. It is well known that the deeper corneal stroma is less resistant to trauma than is the epithelium, and in all probability in these cases the intensity of the fire trauma was not sufficient to injure the epithelium enough to leave permanent traces, but was sufficiently severe to produce the effect on the deeper tissue.

Various degrees of burns of the conjunctiva and lids with all forms of resultant deformities may occur, but that phase of the subject belongs distinctly to the realm of plastic surgery which lies apart from the scope of this paper. It does not seem that there is any immediate therapy that will lessen the severity of corneal involvement of such a burn, and the opacity that results has the tendency to increase in amount and impenetrability until the cornea has lost its major attribute of complete transparency.

METHOD OF PREVENTION

But the prevention of battery burns of the cornea is simple. A protective goggle should be worn by every mechanic who works with charging batteries. The goggle need not be so large that it interferes with work or so close fitting that it prevents the free evaporation of perspiration from the underlying skin, which would result in immediate cloudiness of the glass with diminution of vision. But it should be large enough so that a splash of acid coming from any of the usual working directions would be prevented from reaching the cornea. It is obviously impossible to prevent burning of the skin of the face by a goggle. Further, in every shop in which the possibility of such an explosion exists there should be a large bottle of a sterile saturated solution of sodium bicarbonate and an eye cup. On the occurrence of such an accident, the eye should be flushed thoroughly and repeatedly with eye cups full of the solution in the endeavor to neutralize any free acid that may be present. After that the eye should be filled with sterile borated petrolatum and the victim of the accident sent to the nearest physician. Fortunately, such accidents are not common, but with proper protection they should be eliminated entirely from the repertory of industrial mishaps.

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MERCUROSAL IN THE TREATMENT OF SYPHILIS*

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None of the mercurial preparations used, at present, in the treatment of syphilis are perfect. In the laudable quest for better ones Parke, Davis and Company submit a new mercurial preparation for which several claims have been made. The evidence from the literature that they submit in its favor is of little or no value, since, in practically all cases reported, the patients received arsphenamin as well as Mercurosal. In the first place, they claim that they have a preparation which can be used either by the intramuscular or by the intravenous route. This, of itself, would be advantageous in certain cases in which it would be found impossible to use one of these routes. Secondly, they affirm that the drug has no deleterious effects on the vessel walls. To quote their own words, "Following a long series of intravenous injections in dogs, there was no appreciable effect on the veins at the site of injections." Thirdly, in support of this drug, Parke, Davis and Company say, in advertising in the *Medical Times* and in the Department of Progressive Advertisers, "There is abundant evidence that Mercurosal possesses high spirocheticidal value, and that its administration either intramuscularly or intravenously is not followed by untoward symptoms." Because of these broad claims, it was determined to inquire into them and to find out whether the company had actually evolved a superior mercurial preparation: something that would really add to our armamentarium for the treatment of syphilis. To conduct such a study as this, it is almost necessary to have the patients in the hospital, where they can be observed, not only daily but several times a day; where the urine can be examined daily; where mercurial symptoms can be looked for, once or twice a day, and where one is sure that all directions have been carried out to the letter. Moreover, it is only under such conditions that one can really study the effects on the patients and on the disease. These ideal conditions we have had in the syphilis ward at the Cleveland City Hospital, where it has been possible for us to make all kinds of examinations, including Wassermann tests, dark-field examinations and lumbar punctures, as often as necessary. For our purposes, we have used the drug on thirty-eight different patients, whom we had the opportunity of studying thoroughly. In quite a number of other cases, a few injections were given, but no conclusions could be drawn, inasmuch as the patient would either leave the hospital or refuse treatment, etc. The drug was administered to fifteen patients by the intramuscular route, and to twenty-three patients by the intravenous route, one of these patients receiving part of the drug intravenously and part, intramuscularly.

DOSAGE

The drug was given, as nearly as possible, according to the recommendations of the manufacturers, intra-

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