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BLOODLETTING INSTRUMENTS
in the
NATIONAL MUSEUM OF HISTORY AND TECHNOLOGY

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ABSTRACT

Davis, Audrey, and Toby Appel. Bloodletting Instruments in the National Museum of History and Technology. *Smithsonian Studies in History and Technology*, number 41, 103 pages, 124 figures, 1979.— Supported by variety of instruments, bloodletting became a recommended practice in antiquity and remained an accepted treatment for millenia. Punctuated by controversies over the amount of blood to take, the time to abstract it, and the areas from which to remove it, bloodletters employed a wide range of instruments. All the major types of equipment and many variations are represented in this study of the collection in the National Museum of History and Technology.

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PREFACE

Among the many catalogs of museum collections, few describe objects related to the practice of medicine. This catalog is the first of a series on the medical sciences collections in the National Museum of History and Technology (NMHT). Bloodletting objects vary from ancient sharp-edged instruments to the spring action and automatic devices of the last few centuries. These instruments were used in a variety of treatments supporting many theories of disease and therefore reflect many varied aspects of the history of medicine. Beginning with an essay sketching the long history of bloodletting, this catalog provides a survey of the various kinds of instruments, both natural and man-made, that have been used throughout the centuries.

It is a pleasure to thank the Smithsonian Research Foundation, the Commonwealth Foundation, and the Houston Endowment for their financial support of this project.

Miss Doris Leckie, who did much of the preliminary research and organized part of the collection that led to a draft of this catalog with special emphasis on the cupping apparatus, receives our highest gratitude. Her public lectures on the topic drew much praise. The usefulness of this catalog is due in no small part to her devoted efforts.

For photographing the Smithsonian objects so well we thank Richard Hofmeister, John Wooten, and Alfred Harrell of the Smithsonian Office of Printing and Photographic Services. For analyzing selected objects and answering our requests promptly we thank Dr. Robert Organ, chief; Barbara Miller, conservation director; and Martha Goodway, metallurgist, of the Conservation Analytical Laboratory.

To those who helped us to solve specific problems we extend appreciation to Dr. Arthur Nunes; Dr. Uta C. Merzbach, curator of mathematics, NMHT (especially for finding the poem by Dr. Snodgrass); and Silvio Bedini, deputy director, NMHT, whose enthusiasm and unmatched ability for studying objects has sustained us throughout the period of preparation.

While it is traditional to add a reminder that various unnamed people contributed to a publication, it is imperative to state here that numerous people are essential to the collection, conservation, preservation, and exhibition of museum objects. Without them no collection would survive and be made available to those who come to study, admire or just enjoy these objects. We hope this catalog brings out some of the joy as well as the difficulties of maintaining a national historical medical collection.

BLOODLETTING INSTRUMENTS
IN THE
NATIONAL MUSEUM OF HISTORY AND TECHNOLOGY

AUDREY DAVIS and TOBY APPEL

Introduction

Bloodletting, the removal of blood from the body, has been practiced in some form by almost all societies and cultures. At various times, bloodletting was considered part of the medical treatment for nearly every ailment known to man. It was also performed as punishment or as a form of worship to a Superior Power or Being. It still retains therapeutic value today, although only for an extremely limited range of conditions. In early attempts to extract blood from the body, the skin was penetrated in various places with a sharp instrument made of stone, wood, metal, bristle, or any other rigid material. When it was recognized that a vein visible on the surface of the skin as a blue-green stripe contained blood, the vein was incised directly. To facilitate "breathing a vein" and to provide greater safety, more refined and sharper instruments were devised. As theories supporting bloodletting grew more complex, so too did the instruments.

Spontaneous forms of bleeding, including nosebleed, menstruation, and those instances produced by a blow to any part of the body, apparently inspired the earliest human bloodletters. The Egyptians claimed that the hippopotamus rubbed its leg against a sharp reed until it bled to remove excess blood from its body.[1] The Peruvians noted that a bat would take blood from the toe of a sleeping person when the opportunity presented itself. A deer, and goat, would pick a place near its diseased eye for relief.[2] The methods employed by animals increased interest in using artificial methods for letting blood in man.

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The devices man has employed to remove blood from the body fall into two major categories: (1) those instruments used for general bloodletting, that is, the opening of an artery, or more commonly a vein, and (2) those instruments used in local bloodletting. Instruments in the first category include lancets, spring lancets, fleams, and phlebotomes. Associated with these are the containers to collect and measure the blood spurting from the patient. In the second category are those instruments associated with leeching and cupping. In both of these methods of local bloodletting, only the capillaries are severed and the blood is drawn from the body by some means of suction, either by a leech or by an air exhausted vessel. Instruments in this category include scarificators, cupping glasses, cupping devices, and many artificial leeches invented to replace the living leech.

Much effort and ingenuity was expanded, especially in the eighteenth and nineteenth centuries, to improve the techniques of bloodletting. In the eighteenth century, delicate mechanical spring lancets and scarificators were invented to replace the simpler thumb lancets and fleams. In the nineteenth century, as surgical supply companies began to advertise and market their wares, many enterprising inventors turned their hand to developing new designs for lancets and scarificators, pumps, fancy cupping sets, rubber cups, and all manner of cupping devices and artificial leeches. If we also consider treatments related to bloodletting, in which blood is transferred from one part of the body to another, without actual removal from the body, then we can add the many inventions devoted to dry cupping, irritating the body, and exhausting the air around limbs or even the entire body. Although many physicians continued to use the traditional instruments that had been used for centuries, many others turned eagerly to the latest gadget on the market.

Bloodletting instruments, perhaps the most common type of surgical instrument little more than a century ago, are now unfamiliar to the average person. When one sees them for the first time, one is often amazed at their petite size, careful construction, beautiful materials, and elegant design. One marvels at spring lancets made of silver, thumb lancets with delicate tortoise shell handles, and sets of hand-blown cups in the compartments of a mahogany container with brass and ivory latches and a red plush lining. Those finding such instruments in their attic or in a collection of antiques, even if they can determine that the instruments were used for bloodletting, often have no idea when the instruments were made or how they were used. Frequently a veterinary spring lancet or fleam is mistaken for a human lancet, or a sacrificator for an instrument of venesection. Almost nothing has been written to describe these once common instruments and to place them in historical context. Historians who study the history of medical theory usually ignore medical practice, and they rarely make reference to the material means by which a medical diagnosis or treatment was carried out. It is hoped that this publication will fill a need for a general history of these instruments. This history is pieced together from old textbooks of surgery, medical encyclopedias, compilations of surgical instruments, trade catalogs, and the instruments themselves.

The collection of instruments at the National Museum of History and Technology of the Smithsonian Institution contains several hundred pieces representing most of the major types of instruments. Begun in the late nineteenth century when medical sciences were still part of the Department of Anthropology, the collection has grown steadily through donations and purchases. As might be expected, it is richest in bloodletting instruments manufactured in America in the nineteenth century. One of its earliest acquisitions was a set of four flint lancets used by Alaskan natives in the 1880s. A major source for nineteenth-century instruments is the collection of instruments used by the members of the Medical and Chirurgical Faculty of Maryland, a medical society founded in 1799. The Smithsonian collection also includes patent models of bloodletting instruments submitted to the U.S. Patent Office by nineteenth-century inventors and transferred to the Smithsonian in 1926.

Because we have made an effort to survey every major type of instrument related to bloodletting, it is hoped that this publication will serve as a general introduction to bloodletting instruments, and not merely a guide to the Smithsonian collection. With this goal in mind, the catalog of bloodletting instruments has been preceded by chapters surveying the history of bloodletting and describing, in general terms, the procedures and instruments that have been used since antiquity for venesection, cupping, leeching, and veterinary bloodletting. In the course of our research we have consulted several other collections of bloodletting instruments, notably the collections of the Wellcome Museum of London, the Armed Forces Institute of Pathology, the College of Physicians in Philadelphia, the Institute of the History of Medicine at the Johns Hopkins University, the Howard Dittrick Medical Museum in Cleveland, and the University of Toronto. Illustrations from these collections and references to them have been included in the cases where the Smithsonian collection lacks a particular type of instrument.

Sources

While primary sources describing the procedures and presenting theoretical arguments for and against bloodletting are plentiful, descriptions of the instruments and their manufacture are often difficult to find. Before the nineteenth century, one may find illustrations of bloodletting instruments in the major textbooks on surgery, in encyclopedias such as that of Diderot, and in compendia of surgical instruments written by surgeons. The descriptions following the drawings are often meager and give little indication of where, when, and how the instruments were produced. Until well into the nineteenth century, the tools used by barber-surgeons, surgeons, and dentists were made by blacksmiths, silversmiths, and cutlers. These craftsmen generally left little record of their work. As the demand for surgical instruments increased, specialized surgical instrument makers began to appear, and the cutler began to advertise himself as "Cutler and Surgical Instrument Maker" rather than simply "Cutler and Scissor Grinder." A few advertising cards dating from the eighteenth century may be found, but the illustrated trade catalog is a product of the nineteenth century. Among the earliest compendia/catalogs of surgical instruments written by an instrument maker, rather than by a surgeon, was John Savigny's *A Collection of Engravings Representing the Most Modern and Approved Instruments Used in the Practice of Surgery* (London, 1799). This was followed a few decades later by the brochures and catalog (1831) of the famous London instrument maker, John Weiss. By the 1840s John Weiss, Charrière of Paris, and a few other instrument makers had begun to form surgical supply companies that attempted to market instruments over a wide area. While there are a handful of company trade catalogs dating from the 1840s, 1850s, and 1860s, the great influx of such catalogs came after 1870. Trade catalogs, a major source of information on the new instruments of the nineteenth century, provide the historian with line drawings, short descriptions indicating the mechanism and the material of which the instrument was composed, prices, and patent status. For more details on nineteenth-century instruments one must turn to brochures and articles in medical journals introducing the instruments to the medical profession. These sources provide the most detailed descriptions of how the instruments were constructed, how they were used, and why they were invented. For many American instruments, the descriptions available at the U.S. Patent Office offer illustrations of the mechanism and a discussion of why the instrument was considered novel. One finds specifications for many bizarre instruments that never appear in trade catalogs and may never have been actually sold.

A final source of information is the instruments themselves. Some are engraved with the name of the manufacturer, and a few are even engraved with the date of manufacture. Some have been taken apart to study the spring mechanisms and others examined in the Conservation Analytical Laboratory of the Smithsonian Institution to determine their material content. The documentation accompanying the instruments, while sometimes in error, may serve to identify the individual artifact by name, place and date of manufacture, and to augment our knowledge of the historical setting in which these instruments were used.

Bleeding: The History

The history of bloodletting has been marked by controversy. The extensive literature on bloodletting contains numerous polemical treatises that both extol and condemn the practice. Bloodletting was no sooner criticized as ineffective and dangerous than it was rescued from complete abandonment by a new group of zealous supporters.

From the time of Hippocrates (5th century B.C.) —and probably before, although no written record is available—bloodletting had its vocal advocates and heated opponents. In the 5th century B.C. Aegimious of Eris (470 B.C.), author of the first treatise on the pulse, opposed venesection, while Diogenes of Appolonia (430 B.C.), who described the vena cava with its main branches, was a proponent of the practice. Hippocrates, to whom no specific text on bloodletting is attributed, both approved and recommended venesection.[3]

The anatomist and physician Erasistratus (300–260 B.C.), was one of the earliest physicians to leave a record of why he opposed venesection, the letting of blood from a vein. Erasistratus, who practiced at the court of the King of Syria and later at Alexandria, a celebrated center of ancient medicine, recognized that the difficulty in estimating the amount of blood to be withdrawn and the possibility of mistakenly cutting an artery, tendon, or nerve might cause permanent damage or even death. Since Erasistratus believed that only the veins carried blood while the arteries contained air, he also feared the possibility of transferring air from the arteries into the veins as a result of venesection. Erasistratus was led to question how excessive venesection differed from committing murder.[4]

Through the writings of Aulus Cornelius Celsus (25 B.C.–?), the Roman encyclopedist, and Galen (ca. A.D. 130–200) venesection was restored as a form of orthodox medical treatment and remained so for the next fifteen hundred years. By the time of Celsus, bloodletting had become a common treatment. Celsus remarked in his well-known account of early medicine: "To let blood by incising a vein is no novelty; what is novel is that there should be scarcely any malady in which blood may not be let."[5] Yet criticism of bloodletting continued, for when Galen went to Rome in A.D. 164 he found the followers of Erasistratus opposing venesection. Galen opened up discussion with these physicians in two books, *Against Erasistratus* and *Against the Erasistrateans Dwelling in Rome*. These argumentative dialectical treatises, together with his *Therapeutics of Venesection,* in which he presented his theory and practice of venesection, established Galen's views on bloodletting, which were not effectively challenged until the seventeenth century.[6]

The fundamental theory upon which explanations of health and disease were based, which had its inception in ancient Greek thought and lasted up to the eighteenth century, was the humoral theory. Based on the scientific thought of the Pre-Socratics, the Pythagoreans, and the Sicilians, this theory posited that when the humors, consisting of blood, phlegm, yellow bile, and black bile, were in balance within the body, good health ensued. Conversely, when one or more of these humors was overabundant or in less than adequate supply, disease resulted. The humors were paired off with specific qualities representing each season of the year and the four elements according to the well-accepted doctrine of Empedocles, in which all things were composed of earth, air, fire, and water. Thus, yellow bile, fire, and summer were contrasted to phlegm, water, and winter, while blood, air, and spring were contrasted to black bile, earth, and autumn. When arranged diagrammatically, the system incorporating the humors, elements, seasons, and qualities appears as shown in Figure 1. The earliest formulation of humoralism was to be found in the physiological and pathological theory of the Hippocratic treatise, *On the Nature of Man*.[7]

Plethora, an overabundance of body humors, including blood, which characterized fevers and inflammations, was properly treated by encouraging evacuation. This could be done through drugs that purged or brought on vomiting, by starvation, or by letting blood. During starvation the veins became empty of food and then readily absorbed blood that escaped into the arteries. As this occurred, inflammation decreased. Galen suggested that instead of starvation, which required some time and evacuated the system with much discomfort to the patient, venesection should be substituted to remove the blood directly.[8]

Peter Niebyl, who has traced the rationale for bloodletting from the time of Hippocrates to the seventeenth century, concluded that bloodletting was practiced more to remove excess good blood rather than to eliminate inherently bad blood or

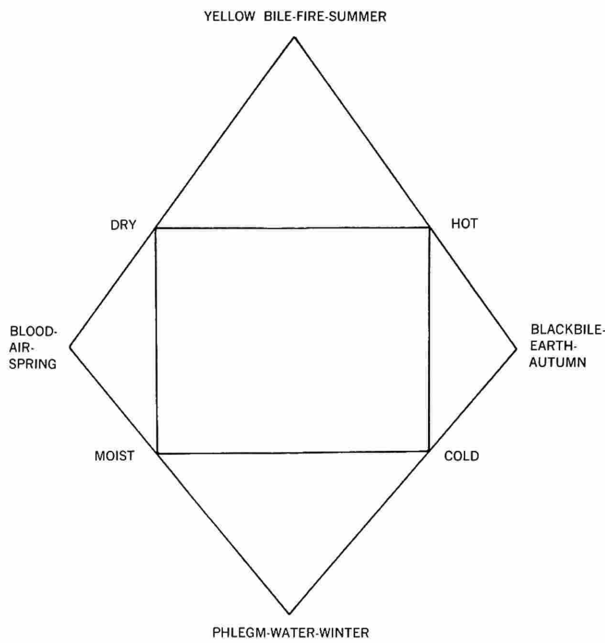

FIGURE 1.—Chart of elements, seasons, and humors.

foreign matter. Generally, venesection was regarded as an equivalent to a reduction of food, since according to ancient physiological theory, food was converted to blood.[9]

Galen defined the criteria for bloodletting in terms of extent, intensity, and severity of the disease, whether the disease was "incipient," "present," or "prospective," and on the maturity and strength of the patient.[10] Only a skilled physician would thus know when it was proper to bleed a patient. Venesection could be extremely dangerous if not correctly administered, but in the hands of a good physician, venesection was regarded by Galen as a more accurate treatment than drugs. While one could measure with great accuracy the dosages of such drugs as emetics, diuretics, and purgatives, Galen argued that their action on the body was directed by chance and could not easily be observed by the physician.[11] However, the effects of bloodletting were readily observed. One could note the change in the color of the blood removed, the complexion of the patient, and the point at which the patient was about to become unconscious, and know precisely when to stop the bleeding.

Galen discussed in great detail the selection of veins to open and the number of times blood might be withdrawn.[12] In choosing the vein to open, its location in respect to the disease was important. Galen recommended that bleeding be done from a blood vessel on the same side of the body as the disease. For example, he explained that blood from the right elbow be removed to stop a nosebleed from the right nostril.[13] Celsus had argued for withdrawing blood near the site of the disease for "bloodletting draws blood out of the nearest place first, and thereupon blood from more distant parts follows so long as the letting out of blood is continued." [14]

Controversy over the location of the veins to be opened erupted in the sixteenth century. Many publications appeared arguing the positive and negative aspects of bleeding from a vein on the same side (derivative—from the Latin *derivatio* from the verb *derivare*, "to draw away," "to divert") or the opposite side (revulsion—from the Latin *revulsio*, "drawing in a contrary direction") of the disordered part of the body. This debate mirrored a broader struggle over whether to practice medicine on principles growing out of medieval medical views or out of classical Greek doctrines that had recently been revived and brought into prominence. The medieval practice was based on the Moslem medical writers who emphasized revulsion (bleeding from a site located as far from the ailment as possible).[15] This position was attacked in 1514 by Pierre Brissot (1478–1522), a Paris physician, who stressed the importance of bleeding near the locus of the disease (derivative bleeding). He was declared a medical heretic by the Paris Faculty of Medicine and derivative bleeding was forbidden by an act of the French parliament. In 1518, Brissot was exiled to Spain and Portugal. In 1539, the celebrated anatomist, Andreas Vesalius, continued the controversy with his famous *Venesection Letter*, which came to the support of Brissot.[16]

Only with the gradual awareness of the implications of the circulation of the blood (discovered in 1628) did discussion of the distinction between derivative and revulsive bloodletting become passé.[17] Long after the circulation of the blood was established, surgical treatises such as those of Lorenz Heister (1719) recommended removing blood from specific parts of the body—such as particular veins in the arm, hand, foot, forehead, temples, inner corners of the eye, neck, and under the tongue. In the nineteenth century this practice was still challenged in the literature as a meaningless procedure.[18] (Figure 2.)

How Much Blood to Take

According to Galen, safety dictated that the first bloodletting be kept to a minimum, if possible. Second, third, or further bleedings could be taken if the condition and the patient's progress seemed to indicate they would be of value. The amount of blood to be taken at one time varied widely.[19]

Galen appears to have been the first to note the amount of blood that could be withdrawn: the greatest quantity he mentions is one pound and a half and the smallest is seven ounces. Avicenna (980–1037) believed that ordinarily there were 25 pounds of blood in a man and that a man could bleed at the nose 20 pounds and not die.[20]

The standard advice to bloodletters, especially in the eighteenth and nineteenth centuries, was "bleed to syncope." "Generally speaking," wrote the English physician and medical researcher, Marshall Hall, in 1836, "as long as bloodletting is required, it can be borne; and as long as it can be borne, it is required." [21] The American physician, Robley Dunglison, defined "syncope" in his 1848 medical dictionary as a "complete and, commonly, sudden loss of sensation and motion, with considerable diminution, or entire suspension of the pulsations of the heart and the respiratory movements." [22] Today little distinction is made between shock and collapse, or syncope, except to recognize that if collapse or syncope persists, shock will result.

We know today that blood volume is about one-fifteenth to one-seventeenth the body weight of an adult. Thus an adult weighing 150 pounds has 9 or 10 pounds of blood in his body. Blood volume may increase at great heights, under tropical conditions, and in the rare disease polycythemia (excess red blood cells). After a pint of blood is withdrawn from a healthy individual, the organism replaces it to some degree within an hour or so. However, it takes weeks for the hemoglobin (the oxygen-bearing substance in the red blood cells) to be brought up to normal.

If blood loss is great (more than 10 percent of the total blood volume) there occurs a sudden, systemic fall in blood pressure. This is a well-known

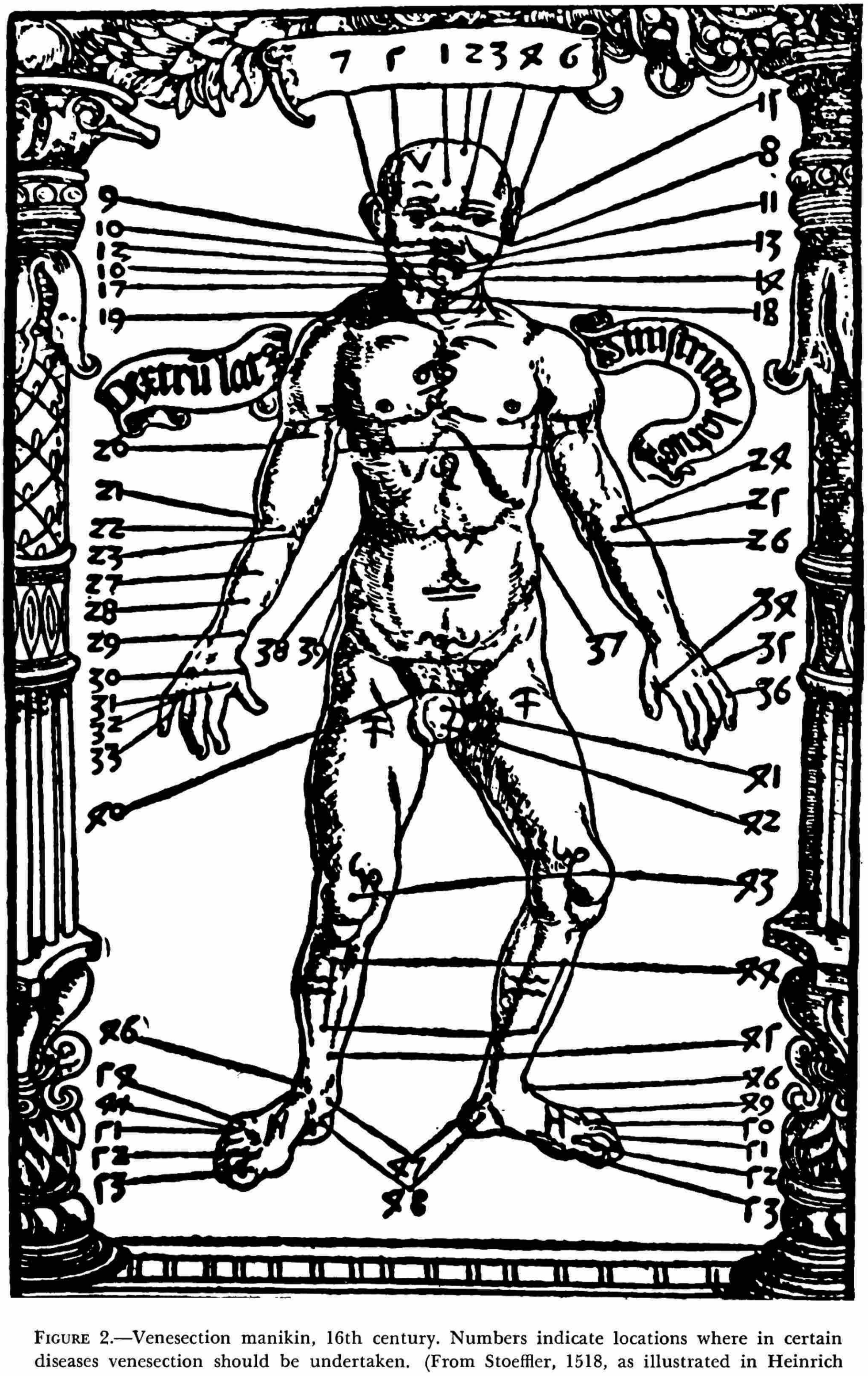

FIGURE 2.—Venesection manikin, 16th century. Numbers indicate locations where in certain diseases venesection should be undertaken. (From Stoeffler, 1518, as illustrated in Heinrich Stern, *Theory and Practice of Bloodletting*, New York, 1915. Photo courtesy of NLM.)

protective mechanism to aid blood clotting. If the volume of blood lost does not exceed 30 to 40 percent, systolic, disastolic, and pulse pressures rise again after approximately 30 minutes as a result of various compensatory mechanisms.[23]

If larger volumes than this are removed, the organism is usually unable to survive unless the loss is promptly replaced. Repeated smaller bleedings may produce a state of chronic anemia when the total amount of blood and hemoglobin removed is in excess of the natural recuperative powers.

When to Bleed

Selecting a time for bleeding usually depended on the nature of the disease and the patient's ability to withstand the process. Galen's scheme, in contrast to the Hippocratic doctrine, recommended no specific days.[24] Hippocrates worked out an elaborate schedule, based on the onset and type of disease, to which the physician was instructed to adhere regardless of the patient's condition.

Natural events outside the body served as indicators for selecting the time, site, and frequency of bloodletting during the Middle Ages when astrological influences dominated diagnostic and therapeutic thought. This is illustrated by the fact that the earliest printed document relating to medicine was the "Calendar for Bloodletting" issued in Mainz in 1457. This type of calendar, also used for purgation, was known as an *Aderlasskalender*, and was printed in other German cities such as Augsburg, Nuremberg, Strassburg, and Leipzig. During the fifteenth century these calendars and *Pestblatter*, or plague warnings, were the most popular medical literature. Sir William Osler and Karl Sudhoff studied hundreds of these calendars.[25] They consisted of a single sheet with some astronomical figures and a diagram of a man (*Aderlassmann*) depicting the influence of the stars and the signs of the zodiac on each part of the body, as well as the parts of the anatomy suitable for bleeding. These charts illustrated the veins and arteries that should be incised to let blood for specific ailments and usually included brief instructions in the margin. The annotated bloodletting figure was one of the earliest subjects of woodcuts. One early and well known *Aderlassmann* was prepared by Johann Regiomontanus (Johannes Müller) in 1473. It contained a dozen proper bleeding points, each suited for use under a sign of the zodiac. Other *Aderlassmanner* illustrated specific veins to be bled. The woodcut produced by the sixteenth-century mathematician, Johannes Stoeffer, illustrated 53 points where the lancet might be inserted.[26]

"Medicina astrologica" exerted a great influence on bloodletting. Determining the best time to bleed reached a high degree of perfection in the late fourteenth and fifteenth centuries with the use of volvella or calculating devices adopted from astronomy and navigation. These were carried on a belt worn around the waist for easy consultation. Used in conjunction with a table and a vein-man drawing, the volvella contained movable circular calculators for determining the accuracy, time, amount, and site to bleed for an illness. The dangers of bloodletting elicited both civic and national concern and control. Statutes were enacted that required every physician to consult these tables before opening a vein to minimize the chance of bleeding improperly and unnecessarily. Consultation of the volvella and vein-man was more important than an examination of the patient.[27] (Figure 3.)

For several centuries, almanacs were consulted to determine the propitious time for bleeding. The "woodcut anatomy" became a characteristic illustration of the colonial American almanac. John Foster introduced the "Man of Signs," as it was called, into the American almanac tradition in his almanac for 1678, printed in Boston. Other examples of early American almanacs featuring illustrations of bleeding include Daniel Leed's almanac for 1693, printed in Philadelphia, and John Clapp's almanac for 1697, printed in New York.

As in many of the medieval illustrations, the woodcut anatomy in the American almanac consisted of a naked man surrounded by the twelve signs of the zodiac, each associated with a particular part of the body (the head and face with Aries, the neck with Taurus, the arms with Gemini, etc.). The directions that often accompanied the figure instructed the user to find the day of the month in the almanac chart, note the sign or place of the moon associated with that day, and then look for the sign in the woodcut anatomy to discover what part of the body is governed by that sign. Bloodletting was usually not specifically mentioned, but it is likely that some colonials still used the "Man

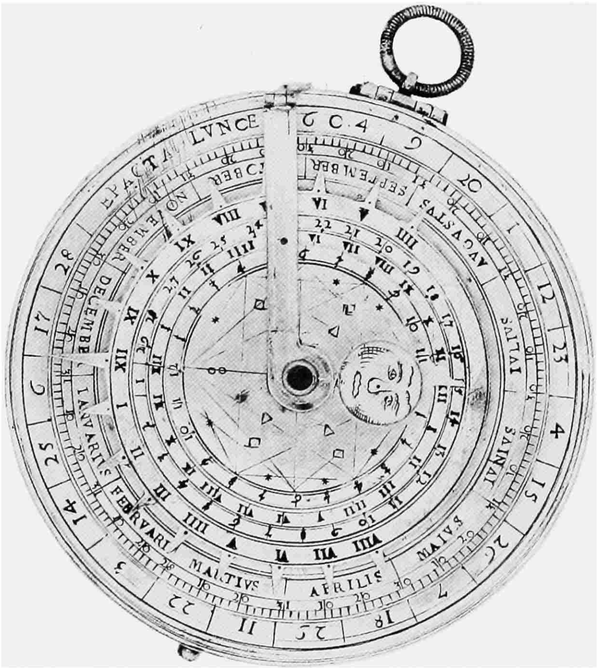

FIGURE 3.—Lunar dial, Germany, 1604. Concentric scales mark hours of the day, days, months, and special astrological numbers. In conjunction with other dials, it enables the user to determine the phases of the moon. (NMHT 30121; SI photo P-63426.)

of Signs" or "Moon's Man" to determine where to open a vein on a given day.[28]

The eighteenth-century family Bible might contain a list of the favorable and unfavorable days in each month for bleeding, as in the case of the Bible of the Degge family of Virginia.[29]

Barber-Surgeons

Even though it was recognized that bleeding was a delicate operation that could be fatal if not done properly, it was, from the medieval period on, often left in the hands of the barber-surgeons, charlatans, and women healers. In the early Middle Ages the barber-surgeons flourished as their services grew in demand. Barber-surgeons had additional opportunities to practice medicine after priests were instructed to abandon the practice of medicine and concentrate on their religious duties. Clerics were cautioned repeatedly by Pope Innocent II through the Council at Rheims in 1131, the Lateran Council in 1139, and five subsequent councils, not to devote time to duties related to the body if they must neglect matters related to the soul.[30]

By 1210, the barber-surgeons in England had gathered together and formed a Guild of Barber-Surgeons whose members were divided into Surgeons of the Long Robe and Lay-Barbers or Surgeons of the Short Robe. The latter were gradually forbidden by law to do any surgery except blood-letting, wound surgery, cupping, leeching, shaving, extraction of teeth, and giving enemas.[31] The major operations were in the hands of specialists, often hereditary in certain families, who, if they were members of the Guild, would have been Surgeons of the Long Robe.

To distinguish his profession from that of a surgeon, the barber-surgeon placed a striped pole or a signboard outside his door, from which was suspended a basin for receiving the blood (Figure 4). Cervantes used this type of bowl as the "Helmet of Mambrino" in Don Quixote.[32] Special

FIGURE 4.—Bleeding bowl with gradations to measure the amount of blood. Made by John Foster of London after 1740. (Held by the Division of Cultural History, Greenwood Collection, Smithsonian Institution; SI photo 61166–C.)

bowls to catch the blood from a vein were beginning to come into fashion in the fourteenth century. They were shaped from clay or thin brass and later were made of pewter or handsomely decorated pottery. Some pewter bowls were graduated from 2 to 20 ounces by a series of lines incised around the inside to indicate the number of ounces of fluid when filled to that level. Ceramic bleeding bowls, which often doubled as shaving bowls, usually had a semicircular indentation on one side to facilitate slipping the bowl under the chin. Bowls to be used only for bleeding usually had a handle on one side. Italian families had a tradition of passing special glass bleeding vessels from generation to generation. The great variety in style, color, and size of bleeding and shaving bowls is demonstrated by the beautiful collection of over 500 pieces of Dr. A. Lawrence Abel of London and by the collection of the Wellcome Historical Museum, which has been cataloged in John Crellin's *Medical Ceramics*.[33] These collections illustrate the stylistic differences between countries and periods.

The barber-surgeons' pole represented the stick gripped by the patient's hand to promote bleeding from his arm. The white stripe on the pole corresponded to the tourniquet applied above the vein to be opened in the arm or leg. Red or blue stripes appeared on early barber poles, but later poles contained both colors.[34]

The dangers posed by untutored and unskilled bleeders were noted periodically. In antiquity Galen complained about non-professional bleeders, and in the Middle Ages, Lanfranc (1315), an outstanding surgeon, lamented the tendency of surgeons of his time to abandon bloodletting to barbers and women.[35] Barber-surgeons continued to let blood through the seventeenth century. In the eighteenth and nineteenth centuries, the better educated surgeon, and sometimes even the physician, took charge of bleeding.

Bloodletting and the Scientific Revolution

The discovery of the blood's circulation did not result in immediate changes in the methods or forms of bloodletting. William Harvey, who published his discovery of circulation in 1628, recognized the value of investigating the implications of his theory. Harvey could not explain the causes and uses of the circulation but he believed that it did not rule out the practice of bloodletting. He claimed that

> daily experience satisfies us that bloodletting has a most salutary effect in many diseases, and is indeed the foremost among all the general remedial means: vitiated states and plethora of blood, are causes of a whole host of disease; and the timely evacuation of a certain quantity of the fluid frequently delivers patients from very dangerous diseases, and even from imminent death.[36]

The English scientist Henry Stubbe brought to the surface what would appear to be an obvious dilemma: How could one bleed to produce local effect if the blood circulated? Stubbe commented in 1671:

> I do say, that no experienced Physician ever denied the operation of bloodletting though since the tenet of the Circulation of the Blood the manner how such an effect doth succeed admits of some dispute, and is obscure. We the silly followers of Galen and the Ancients do think it an imbecility of judgement, for any to desert an experienced practice, because he doth not comprehend in what manner it is effected.[37]

In the early nineteenth century the physiologist François Magendie (1783–1855), who argued against bloodletting, showed that the physiological effects of opening different veins was exactly the same, and therefore the choice of which vein to bleed did not affect the procedure.[38]

The first serious modern challenges to bloodletting were made in the sixteenth and seventeenth centuries under the leadership of the German alchemist Paracelsus and his Belgian follower, Van Helmont. The medical chemists or iatrochemists espoused explanations for and treatments of diseases based on chemical theories and practices. They believed that the state of the blood could best be regulated by administering the proper chemicals and drugs rather than by simply removing a portion of the blood. Iatrochemistry provided a substitution in the form of medicinals to quell the flow of blood for therapeutic purposes.[39]

The revival of Hippocratic medicine in the late seventeenth and eighteenth centuries also led to questioning the efficacy of bloodletting. The Hippocratic treatises, while they occasionally mentioned bloodletting, generally stressed nature's power of cure. This school of medicine advocated a return to clinical observation and a reduction of activist intervention. Treatments such as bloodletting, it was felt by the neo-Hippocratists, might merely serve to weaken the patient's strength and hinder the healing processes of nature.[40]

A rival group of medical theorists also flourished in this period. The iatrophysicists, who concentrated on mechanical explanations of physiological events, remained adherents of bloodletting. Their support of the practice ensured its use at a time when the first substantial criticism of it arose.

Instrumentation and Techniques

Sharp thorns, roots, fish teeth, and sharpened stones were among the early implements used to let blood.[41] Venesection, one of the most frequently mentioned procedures in ancient medicine, and related procedures such as lancing abcesses, puncturing cavities containing fluids, and dissecting tissues, were all accomplished in the classical period and later with an instrument called the phlebotome. *Phlebos* is Greek for "vein," while "tome" derives from *temnein*, meaning "to cut." In Latin, "phlebotome" becomes "flebotome," and in an Anglo-Saxon manuscript dating from A.D. 1000, the word "fleam" appears. The phlebotome, a type of lancet, was not described in any of the ancient literature, but its uses make it apparent that it was a sharp-pointed, double-edged, and straight-bladed cutting implement or scalpel similar to the type later used for splitting larger veins.[42]

Several early Roman examples of phlebotomes have been collected in European museums. One, now in the Cologne Museum, was made of steel with a square handle and blade of myrtle leaf shape. Another specimen, made of bronze, was uncovered in the house of the physician of *Strada del Consulare* of Pompeii. This specimen, now in the Naples Museum, is 8 cm long and 9 mm at the broadest part of the blade, and its handle bears a raised ring ornamentation.[43] A number of copies of Roman instruments have been made and some have passed into museum collections. Some of the copies were commissioned by Sir Henry Wellcome for the Wellcome Historical Medical Museum collection and the Howard Dittrick Historical Medical Museum in Cleveland. They emulate the size, color, and aged condition of the originals and make it very difficult for the inexpert to distinguish an original from its replica. It is, however, impossible to fully duplicate the patina of ancient bronze.[44] Seventeenth-century and later bloodletting instruments usually have not been copied.[45]

From the earliest examples of the fleam, such as the specimen found at Pompeii, this instrument has been associated with the veterinarian. Since early practitioners, particularly the Roman physician, performed the duties of the surgeon as well as those of the veterinarian, it is possible that they used the same instrument to open blood vessels in humans and animals.[46]

In the seventeenth and eighteenth centuries a type of fleam (German *fliete*, French *flamette*), which had a pointed edge at right angles to the handle, was in use in Germany, Holland, and Vienna, Austria.[47] Since the specimens found in museums vary in size, it is likely that this type of fleam was used on both animals and humans.

In about the fifteenth century the thumb lancet, also called a *gladiolus, sagitella, lanceola, lancetta,* or *olivaris*, was introduced.[48] It soon became the preferred instrument for opening a vein in any part of the body. The double-edged iron or steel blade was placed between two larger covers, usually made of horn or shell, and all three pieces were united at the base with a riveted screw. The blade could be placed at various angles of inclination when in use. The shape of the blade, whether broad or narrow, determined the ease with which the skin and vein could be penetrated. A long slender blade was essential to pierce a vein located below many layers of fatty tissue.[49] These tiny and delicate thumb lancets were often carried in small flat cases of silver, tortoise shell, shagreen, or leather with hinged tops and separate compartments for each lancet. (Figure 5.)

A surgeon was advised to carry lancets of various sizes and shapes in order to be prepared to open veins of differing sizes and in different locations. Even Hippocrates had cautioned bloodletters not to use the different size lancets indiscriminately, "for there are certain parts of the body which have a swift current of blood which it is not easy to stop." [50] For vessels that bled easily, it was essential to make narrow openings; otherwise it would be difficult, if not impossible, to stop the flow of the blood. For other vessels, lancets that made larger openings were required or the blood would not flow satisfactorily.

The blood as it spurted from the vein would be collected in a container and measured. When enough blood was removed, the bleeding would

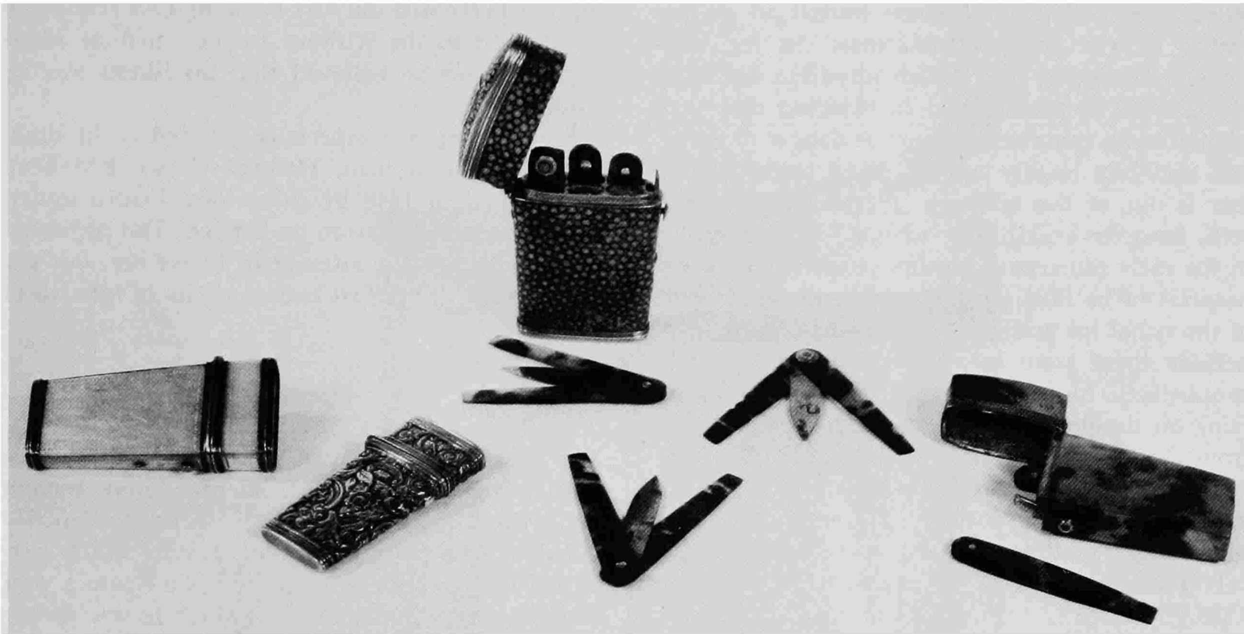

FIGURE 5.—18th–19th century lancets and lancet cases. The cases are made of mother-of-pearl, silver, shagreen, and tortoise shell. (NMHT 308730.10. SI photo 76–9116.)

be stopped by a bandage or compress applied to the incision.

Teaching a medical student how to bleed has had a long tradition. Before approaching a patient, the student practiced opening a vein quickly and accurately on plants, especially the fruits and stems.[51] The mark of a good venesector was his ability not to let even a drop of blood be seen after the bleeding basin was removed.[52]

It required some degree of skill to strike a vein properly. The most common vein tapped was in the elbow, although veins in the foot were also popular. The arm was first rubbed and the patient given a stick to grasp. Then a tourniquet would be applied above the elbow (or, if the blood was to be taken from the foot, above the ankle), in order to enlarge the veins and promote a continuous flow of blood. Holding the handle between the thumb and the first finger, the operator then jabbed the lancet into the vein. Sometimes, especially if the vein was not close to the surface of the skin, the instrument was given an extra impetus by striking it with a small mallet or the fingers to insure puncturing the vein.[53] The incisions were made diagonally or parallel to the veins in order to minimize the danger of cutting the vein in two.[54]

For superficial veins, the vein was sometimes transfixed, that is, the blade would be inserted underneath the vessel so that the vessel could not move or slip out of reach. The transfixing procedure ensured that the vein would remain semi-divided so that blood would continuously pass out of it, and that injury to other structures would be avoided. Deep-lying veins of the scalp, for example, could not be transfixed. They were divided by cutting through everything overlying them since there were no important structures to injure.[55]

The consequences of puncturing certain veins incorrectly were discussed by many early writers including Galen, Celsus, Antyllus, and Paul of Aegina.[56] Injury to a nearby nerve, muscle, or artery resulted in convulsions, excessive bleeding, or paralysis.

Bloodletting was at its most fashionable in the eighteenth and early nineteenth centuries. In this period it was considered an art to hold the lancet properly and to support the arm of the patient with delicacy and grace.[57] Many patients had by repeated bloodlettings become inured to its potential danger and unpleasantness. In the mid-eighteenth century one British physician declared: "People are so familiarized to bleeding that they cannot easily conceive any hurt or danger to ensue, and therefore readily submit, when constitutional fear is out of the question, to the opening of a vein, however unskillfully advised." [58] In England in the early nineteenth century people came to the hospital to be bled in the spring and fall as part of the ritual for maintaining good health. At some periods there were so many people undergoing prophylactic bloodletting that they could be seen lying on the floor of the hospital while recovering from the faintness induced by venesection.[59]

The lancet was perhaps the most common medical instrument. *The Lancet* was the name of one of the oldest and most socially aware English medical journals, founded by Thomas Wakeley in 1823.[60]

In America, Benjamin Rush (1746–1813) promoted vomits, purges, salivation, and especially bleeding. Rush, a signer of the Declaration of Independence, is notorious in medical history for his resorting to massive bleedings during the epidemics of yellow fever at the end of the eighteenth century. Rush told a crowd of people in 1793: "I treat my patients successfully by bloodletting, and copious purging with calomel and jalop and I advise you, my good friends, to use the same remedies." "What?" called a voice from the crowd, "Bleed and purge everyone?" "Yes," said the doctor, "bleed and purge all Kensington." [61]

The alternatives to bleeding in this period included administering mercury (calomel) to promote salivation and tartar emetic to induce vomiting. These substitutes could be as hazardous as bleeding and offered little choice to the patient who had to bear the unpleasant effects. Thus, the late eighteenth and early nineteenth century has been referred to by historians as the era of heroic medicine because of the large amounts of strong medications given and excessive bloodletting.[62]

One of the most notable victims of heroic medicine during this period was George Washington (1732–1799), who was bled four times in two days after having contracted a severe inflammation of the throat. Washington's physician, Dr. Craik, admitted that the removal of too much blood might have been the cause of his death. Additional bleeding was prevented only by Washington's request to be allowed to die without further medical intervention, since he believed that his illness was incurable.[63]

Bloodletting was especially resorted to in times of crisis. One woman, Hannah Green, had been anesthetized in 1848 by chloroform before undergoing a minor operation on her toe. The physician bled her in a futile attempt to revive her, but she died, becoming the first known victim of inhalation anesthesia.[64]

Spring Lancets

The great vogue in phlebotomy inspired the invention of ingenious instruments. From Vienna came the automatic or spring lancet, originally called a *Schnepper* or *Schnepperlein*, which permitted the operator to inject the blade into a vein without exerting manual pressure.[65] It was widely adopted if the variety of models now extant is a proper indication. In the spring lancet, the blade was fixed into a small metal case with a screw and arranged to respond to a spring that could be released by a button or lever on the outside of the case. The blade was positioned at right angles to the spring and case, thus adopting the basic shape of the fleam. The case of the spring lancet was usually made of copper, silver, brass, or an alloy. It was often decorated with engraved furbelows or embossed with political or other symbols depending on the preference of the owner and the fashion of the period. The mechanism of this handsome implement has been described by a modern collector (Figures 6, 7):

> The curved projection (1) is the continuation of a heavy coiled spring. When pushed up it catches on a ratchet. A razor sharp blade (2), responding to the pressure of a light spring placed under it, follows the handle as it goes up. A lever (3) acting on a fulcrum (4) when pressed down, releases handle which in turn strikes the lancet down with lightning speed.[66]

The spring lancet was initially described by Lorenz Heister in 1719.[67] Another early description appeared in 1798 in the first American edition of the *Encyclopedia or Dictionary of Arts and Sciences*, in which the spring lancet was called a "phleam." [68]

The spring lancet for use on humans was a rather tiny instrument. Its casing was about 4 cm

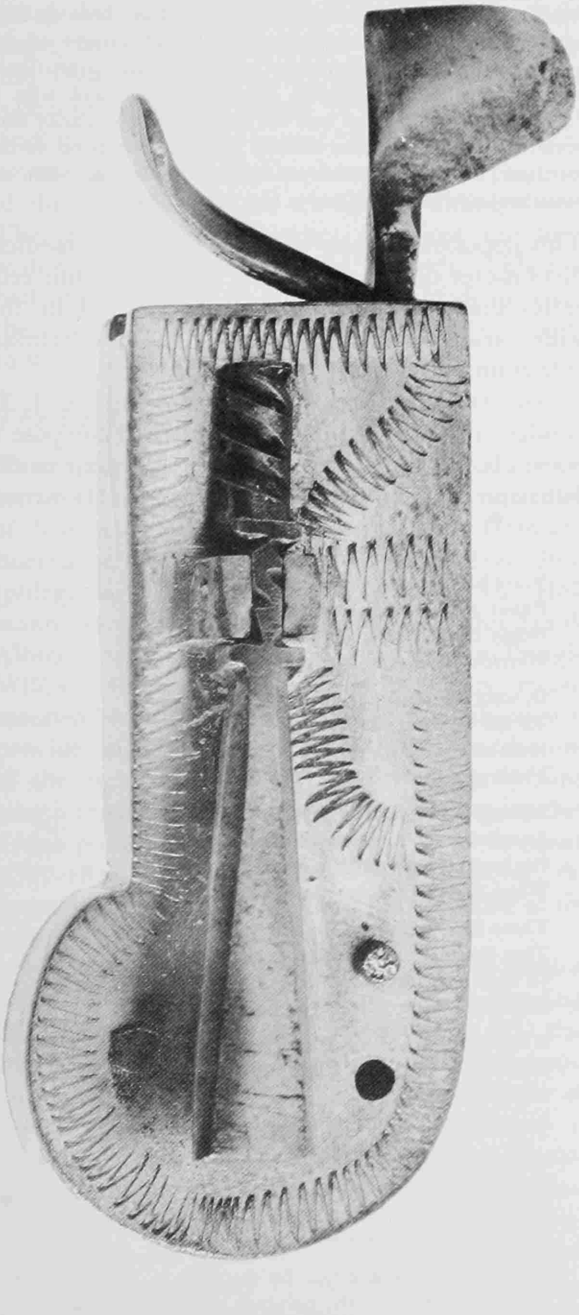

FIGURE 6.—Spring lancet, 19th century. (NMHT 321636.01; SI photo 73–4236.)

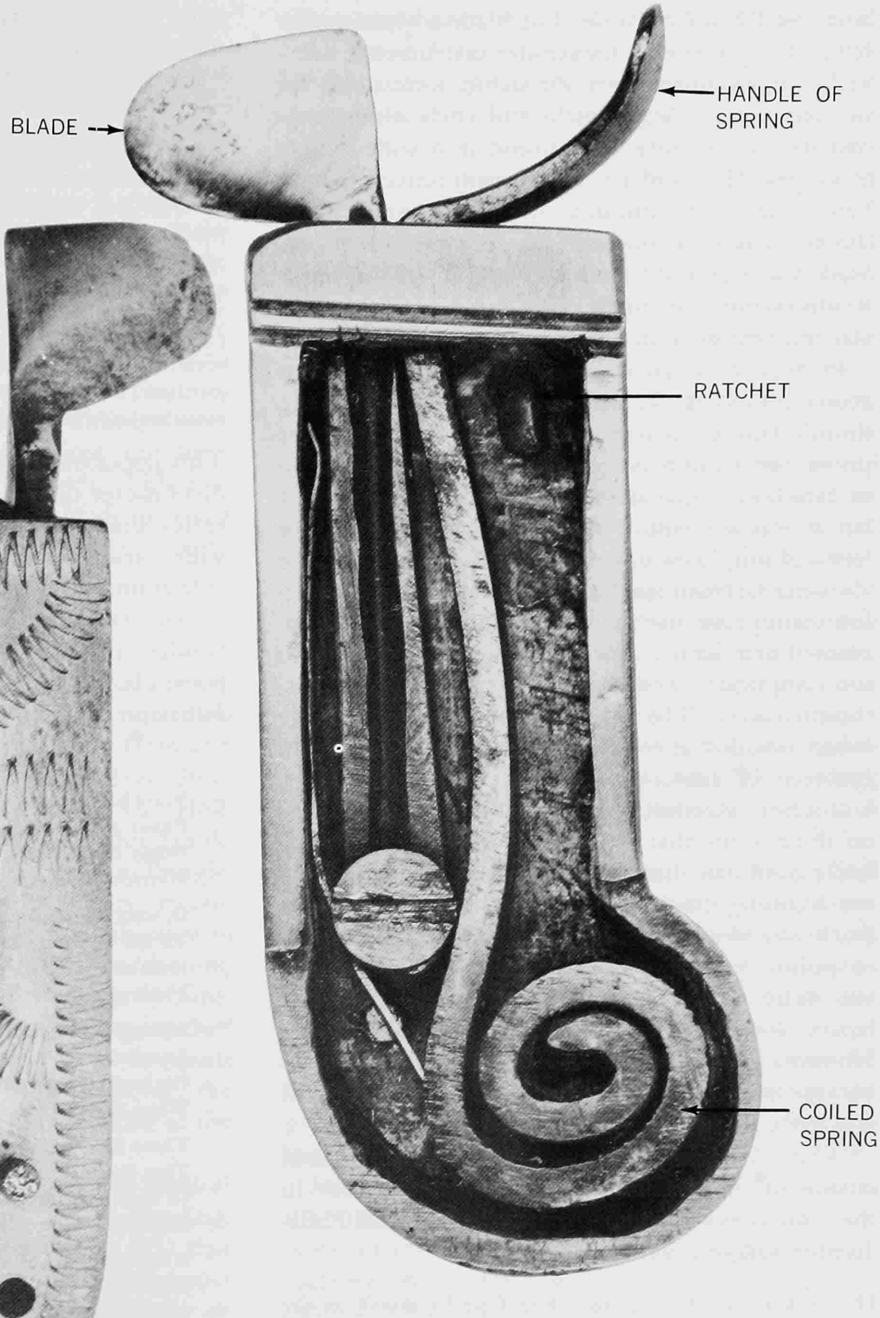

FIGURE 7.—Interior of spring lancet. (NMHT 308730.10; SI photo 76–13535.)

long and 1.5 to 2 cm wide. The blade added another centimeter in length. Larger size instruments, often with a metal guard over the blade, were made for use on animals. Eighteenth- and early nineteenth-century spring lancets are found in a wide variety of shapes. Mid- and late nineteenth-century spring lancets are more uniform in shape, most having the familiar knob-shaped end. In most lancets the blade was released by a lever, but in the late nineteenth century, the blade of a more expensive model was released by a button.

In general, German, American, and Dutch surgeons preferred the spring lancet to the simple thumb lancet. In contrast, the French tended to prefer the thumb lancet. Ristelhueber, a surgeon in Strasbourg, maintained in 1819 that the simple lancet was preferable to the spring lancet both in terms of simplicity of design and application. While allowing German surgeons some credit for attempting to improve the spring lancet, Ristelhueber remained firm in his view that the spring lancet was too complicated and performed no better than the thumb lancet. The only advantage of the spring lancet was that it could be used by those who were ignorant of anatomy and the art of venesection. Untutored bleeders could employ a spring lancet on those veins that stood out prominently and be fairly confident that they could remove blood without harming other blood vessels. The bagnio men (bath attendants), who routinely bled the bathers in public baths, preferred the spring lancet.[69] It was more difficult to sever a vein with a spring lancet and thereby cause serious hemorrhaging. However, since the spring lancet was harder to clean because of its small size and its enclosed parts, it was more likely to induce infection (phlebitis).

While the French and British surgeons remained critical of the spring lancet, it became popular in the United States. John Syng Dorsey, a noted Philadelphia surgeon, wrote in 1813:

> The German fleam or spring lancet I prefer greatly to the common English lancet for phlebotomy; it is now in some parts of the United States almost exclusively used. In a country situated like the United States, where every surgeon, except those residing in our largest cities, is compelled to be his own cutler, at least so far as to keep his instruments in order, the spring-lancet has a decided preference over the lancet; the blade of this can with great ease be sharpened by any man of common dexterity, and if not very keen it does no mischief, whereas a dull lancet is a most dangerous instrument; and no one can calculate with certainty the depth to which it will enter. To sharpen a lancet, is regarded by the cutler as one of his nicest and most difficult jobs; it is one to which few surgeons are competent.
>
> The safety of using the fleam is demonstrated by daily experience; there is no country in which venesection is more frequently performed than in the United States, and perhaps none where fewer accidents from the operation have occurred, of those few, I beg leave to state, that all the aneurisms produced by bleeding, which I have seen, have been in cases where the lancet was used. Among the advantages of the spring-lancet economy is not the least. A country practitioner who is constantly employing English lancets, and who is particular in using none but the best, must necessarily consume half the emoluement derived from the operation, in the purchase of his instruments. One spring-lancet, with an occasional new blade, will serve him all his life.[70]

This popularity is also reflected in various medical dictionaries of the eighteenth and nineteenth centuries that described the instrument and in the wide variety of spring lancets in the Smithsonian collection.

One American user of the spring lancet, J. E. Snodgrass of Baltimore, was inspired to compose a poem about the instrument, which appeared in the *Baltimore Pheonix and Budget* in 1841. He wrote:

To My Spring-Lancet

Years have passed since first we met,
Pliant and ever-faithful-slave!
Nobly thou standest by me yet,
Watchful as ever and as brave.

O, were the power of language thine,
To tell all thou hast seen and done,
Methinks the curious would incline,
Their ears to dwell they tales upon!

I love thee, bloodstain'd, faithful friend!
As warrior loves his sword or shield;
For how on thee did I depend
When foes of Life were in the field!

Those blood spots on thy visage, tell
That thou, thro horrid scenes, hast past.
O, thou hast served me long and well;
And I shall love thee to the Last!

A thousand mem'ries cluster round thee
In all their freshness! thou dost speak
Of friends far distant-friends who found thee
Aye with thy master, prompt to wreak

Vengeance on foes who strove to kill
With blows well aim'd at heart or head—
Thieves that, with demon heart and will,
Would fain have on they vials fed.

O, They have blessed thee for thy aid,
When grateful eyes, thy presence, spoke;
Thou, anguish'd bosoms, glad hast made,
And miser's tyrant sceptre broke.

Now, when 'mong strangers, is our sphere,
Thou, to my heart, are but the more.
Endear'd—as many a woe-wring tear
Would plainly tell, if from me tore!

There was little change in the mechanism of the spring lancet during the nineteenth century, despite the efforts of inventors to improve it. Approximately five American patents on variations of the spring lancet were granted in the nineteenth century. One patent model survives in the Smithsonian collection. Joseph Gordon of Catonsville, Maryland, in 1857 received patent No. 16479 for a spring lancet constructed so that three different positions of the ratchet could be set by the sliding shield. The position of the ratchet regulated the force with which the blade entered the vein. This also had the advantage of allowing the blade to enter the vein at the same angle irrespective of the depth to which it penetrated.[71]

The Decline of Bleeding

Throughout the seventeenth, eighteenth, and nineteenth centuries, most physicians of note, regardless of their explanations of disease, including Hermann Boerhaave, Gerard Van Swieten, Georg Ernst Stahl (phlogiston), John Brown and Friedrich Hoffmann (mechanistic theories), Johann Peter Frank, Albrecht von Haller, Percival Pott, John Pringle, William Cullen, and Francois Broussais, recommended bloodletting and adjusted their theories to provide an explanation for its value. At the end of the eighteenth century and in the early nineteenth century, the practice of bloodletting reached a high point with the theories of F.–J.–V. Broussais (1772–1838) and others. After 1830, however, the practice gradually declined until, by the end of the century, it had all but disappeared.

This decline occurred even though many medical theories were brought to the defense of bleeding. A French medical observer commented in 1851 that "l'histoire de la saignée considerée dans son ensemble, constituerait presque à elle seule l'histoire de toutes les doctrines médicales" (the history of bloodletting, considered in its totality, would constitute almost by itself the history of all medical doctrines).[72] There was no crisis of medical opinion, and no one event to account for this decline. The French physician, Pierre Louis's statistical investigation (numerical method) into the effect of bloodletting in the treatment of pneumonia has often been cited as a cause for the downfall of venesection,[73] but the results of Louis's research showed only that bloodletting was not as useful as was previously thought. Louis's work, however, was typical of a new and critical attitude in the nineteenth century towards all traditional remedies. A number of investigators in France, Austria, England, and America did clinical studies comparing the recovery rates of those who were bled and those who were not.[74] Other physicians attempted to measure, by new instruments and techniques, the physiological affects of loss of blood. Once pathological anatomy had associated disease entities with specific lesions, physicians sought to discover exactly how remedies such as bloodletting would affect these lesions. In the case of pneumonia, for example, those who defined the disease as "an exudation into the vessels and tissues of the lungs" could not see how bloodletting could remove the coagulation. John Hughes Bennett, an Edinburgh physician, wrote in 1855: "It is doubtful whether a large bleeding from the arm can operate upon the stagnant blood in the pulmonary capillaries—that it can directly affect the coagulated exudation is impossible."[75] Bennett felt that bloodletting merely reduced the strength of the patient and thus impeded recovery.

Bloodletting was attacked not only by medical investigators, but much more vehemently by members of such medical sects as the homeopaths and botanics who sought to replace the harsh remedies of the regular physicians by their own milder systems of therapeutics.[76]

As a result of all this criticism the indications for bleeding were gradually narrowed, until at the present time bloodletting is used in only a few very specific important instances.

In England and America, in the last quarter of the nineteenth century, a last serious attempt was made to revive bloodletting before it died out altogether. A number of Americans defended the limited use of bleeding, especially in the form of venesection. The noted American physician, Henry I. Bowditch, tried in 1872 to arouse support for venesection among his Massachusetts Medical Society colleagues. He noted that venesection declined more than any other medical opinion in the esteem of the physician and the public during the previous half century. At the beginning of his career, he had ignored the request of his patients who wanted annual bloodlettings to "breathe a vein" to maintain good health. He eventually found that to give up the practice entirely was as wrong as to overdo it when severe symptoms of a violent, acute cardiac disease presented themselves. Lung congestion and dropsy were other common disorders that seemed to him to be relieved, at least temporarily, by venesection.[77]

In 1875 the Englishman W. Mitchell Clarke, after reviewing the long history of bloodletting and commenting on the abrupt cessation of the practice in his own time, wrote:

> Experience must, indeed, as Hippocrates says in his first aphorism, be fallacious if we decide that a means of treatment, sanctioned by the use of between two and three thousand years, and upheld by the authority of the ablest men of past times, is finally and forever given up. This seems to me to be the most interesting and important question in connection with this subject. Is the relinquishment of bleeding final? or shall we see by and by, or will our successors see, a resumption of the practice? This, I take it, is a very difficult question to answer; and he would be a very bold man who, after looking carefully through the history of the past, would venture to assert that bleeding will not be profitably employed any more.[78]

An intern, Henri A. Lafleur of the newly founded Johns Hopkins Hospital, reported on five patients on whom venesection was performed between 1889 and 1891. Lafleur defended his interest in the subject by calling attention to other recent reports of successes with bleeding, such as that of Dr. Pye-Smith of London. He concluded that at least temporary relief from symptoms due to circulatory disorders, especially those involving the pulmonary system, was achieved through venesection.

Pneumonia and pleurisy were the primary diseases for which venesection was an approved remedy.[79] It had long been believed by bloodletters that these complaints were especially amenable to an early and repeated application of the lancet.[80] Austin Flint had explained in 1867 that bloodletting "is perhaps more applicable to the treatment of inflammation affecting the pulmonary organs than to the treatment of other inflammatory affections, in consequence of the relations of the former [pulmonary organs] to the circulation." [81] Thus, while bloodletting for other diseases declined throughout the nineteenth century, it continued to be advocated for treating apoplexy, pneumonia, and pulmonary edema.[82]

The merit of phlebotomy for those afflicted with congestive heart failure was emphasized again in 1912 by H. A. Christian. This condition led to engorgement of the lungs and liver and increased pressure in the venous side of the circulation. Articles advocating bloodletting continued into the 1920s and 1930s.[83]

Bloodletting is currently being tested as a treatment for those suffering from angina or heart attacks. Blood is removed on a scheduled basis to maintain the hematocrit (the percentage of red blood cells in the blood) at a specified level. Keeping the hematocrit low has provided relief to those being tested.[84] Other benefits of removing blood, including the lowering of blood pressure, can be obtained by the use of antihypertensive drugs. Thus the valid indications for bleeding are being supplanted by the use of modern drugs that accomplish the same end.

By the twentieth century the lancet was replaced in some quarters by safer devices for removing blood and injecting fluids into the bloodstream. Heinrich Stern improved Strauss's special hyperdermic needle. In 1905 Stern designed a venepuncture or aspirating needle that was 7 cm long with a silver cannula of 4 cm. Attached to the handle was a thumb-rest and a tube for removing or adding fluids and a perforator within the cannula. He recommended that the forearm be strapped above the elbow and that the instrument be thrust into the most prominent vein. This streamlined vein puncturing implement reduced the possibility of injecting air and bacteria into the blood.[85] It was, and continues to be, used to withdraw blood for study in the laboratory, to aid in diagnosis of disease, and to collect blood for transfusing into those who need additional blood during an operation or to replace blood lost in an accident or disease. The blood is collected in a glass or plastic graduated container and stored under refrigeration. The study of blood donors has, incidentally, given insights into the physiology of bloodletting since the volume customarily removed from a donor is about the same in volume as that taken by a bleeder (one pint or 500 cc).[86]

The annual physical examination today includes taking a small amount of blood from the finger or a vein in the elbow. This blood is then analyzed for the presence of biochemical components of such diseases as diabetes, anemia, arteriosclerosis, etc. A tiny sterile instrument called a blood lancet may be used by the technician who draws the blood, who is still called by the historical name, phlebotomist.

Cupping

"Cupping is an art," wrote the London cupper Samuel Bayfield in 1823, "the value of which every one can appreciate who has had opportunities of being made acquainted with its curative power by observing its effects on the person of others, or by realizing them in his own." [87] The curious operation of taking blood by means of exhausted cups had been part of Western medicine since the time of Hippocrates, and has been found in many other cultures as well. It is still practiced in some parts of the world today.

Since antiquity medical authors have distinguished two forms of cupping, dry and wet. In dry cupping, no blood was actually removed from the body. A cup was exhausted of air and applied to the skin, causing the skin to tumefy. In wet cupping, dry cupping was followed by the forming of several incisions in the skin and a reapplication of the cups in order to collect blood. It was possible to scarify parts of the body without cupping—through the nineteenth-century physicians recommended scarifying the lips, the nasal passages, the eyes, and the uterus. In order to remove any sizeable amount of blood, however, it was necessary to apply some sort of suction to the scarifications, because capillaries, unlike arteries and veins, do not bleed freely. (Figure 8.)

Cupping was generally regarded as an auxiliary to venesection. The indications for the operation were about the same as the indications for phlebotomy, except that there was a tendency to prefer cupping in cases of localized pain or inflammation, or if the patient was too young, too old, or too weak to withstand phlebotomy. "If cutting a vein is an instant danger, or if the mischief is still localised, recourse is to be had rather to cupping," wrote the encyclopedist Celsus in the first century A.D.[88]

As noted above, the ancients usually recommended cupping close to the seat of the disease. However, there were several examples in ancient writings of cupping a distant part in order to divert blood. The most famous of these examples was Hippocrates' recommendation of cupping the breasts in order to relieve excessive menstruation.[89]

As was the case for phlebotomy, the number of ills that were supposedly relieved by cupping was enormous. Thomas Mapleson, a professional cupper, gave the following list of "diseases in which cupping is generally employed with advantage" in 1801:

> Apoplexy, angina pectoris, asthma, spitting blood, bruises, cough, catarrh, consumption, contusion, convulsions, cramps, diseases of the hip and knee joints, deafness, delirium, dropsy, epilepsy, erysipelas, eruptions, giddiness, gout, whooping cough, hydrocephalus, head ache, inflammation of the lungs, intoxication, lethargy, lunacy, lumbago, measles, numbness of the limbs, obstructions, ophthalmia, pleurisy, palsy, defective perspiration, peripneumony, rheumatism, to procure rest, sciatica, shortness of breath, sore throat, pains of the side and chest.[90]

Early Cupping Instruments

Mapleson believed that cupping was first suggested by the ancient practice of sucking blood from poisoned wounds. In any case, the earliest cupping instruments were hollowed horns or gourds with a small hole at the top by which the cupper could suck out the blood from scarifications previously made by a knife. The Arabs called these small vessels "pumpkins" to indicate that they were frequently applied to a part of the body in which the organs contained air or that they were vessels that had to be evacuated before they could be applied.[91] The use of cattle horns for cupping purposes seems to have been prevalent in all periods up to the present. When Prosper Alpinus visited Egypt in the sixteenth century, he found the Egyptians using horns that were provided with a small valve of sheepskin to be maintained in place by the cupper's tongue and serving to prevent the intake of air once the cup was exhausted.[92]

In nineteenth-century America, at least one physician still recommended horns as superior to glass cups for rural medical practice. A Virginia physician, Dr. W. A. Gillespie, disturbed by the high cost of cupping instruments, suggested to his readers in *The Boston Medical and Surgical Journal* for 1834 that since glass cups were often broken when carried from place to place, "an excellent substitute can be made of a small cow horn, cornicula, which may be scraped or polished until perfectly diaphanous or transparent." [93]

The Smithsonian collection contains a cow's

FIGURE 8.—Scarification without cupping in Egypt in the 16th century. To obtain sufficient blood, 20 to 40 gashes were made in the legs and the patient was made to stand in a basin of warm water. (From Prosper Alpinus, *Medicina Aegyptorum*, Leyden, 1719. Photo courtesy of NLM.)

horn from Madaoua, Niger Republic (West Africa), used for drawing blood in the 1960s. The director of the Baptist Mission, who sent the horn, noted that he had often seen Africans sitting in the market place with such horns on their backs or their heads. Scarifications were made with a handmade razor.[94]

In addition to horn cups, the ancients employed bronze cups in which a vacuum was obtained by inserting a piece of burning flax or linen into the cup before its application to the skin. Most Greek and Roman cups were made of metal.[95] Although Galen already preferred glass cups to metal cups for the simple reason that one could see how much blood was being evacuated, metal cups were used until modern times. Their main virtue was that they did not break and thus could be easily transported. For this reason, metal cups were especially useful to military surgeons. Brass and pewter cups were common in the eighteenth century, and tin cups were sold in the late nineteenth century.

Since the latter part of antiquity, cups have been made of glass. The Smithsonian possesses two Persian opaque glass cups dating from the twelfth century, called "spouted glasses" because of the spout protruding from the side of the cup by which the cupper exhausted the air with his mouth. Similar spouted glasses were illustrated by Prosper Alpinus (sixteenth century), so designed that the blood would collect in a reservoir instead of being sucked into the cupper's mouth. Like the horn cups illustrated by Alpinus, the glass cups were provided with a small valve made of animal skin. It appears that the sixteenth-century Egyptians were not familiar with the use of fire for exhausting cups. (Figure 9.)

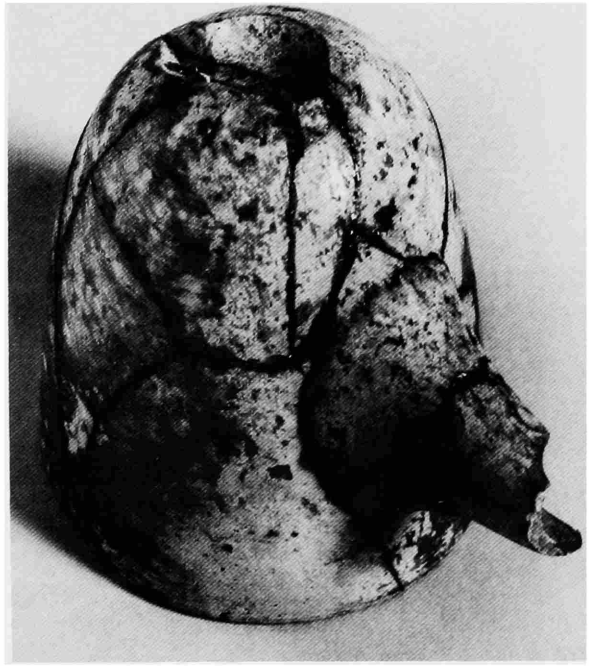

FIGURE 9.—Persian spouted cupping glass, 12th century. (NMHT 224478 [M-8037]; SI photo 73-4215.)

Cupping and leeching were less frequently practiced in the medieval period, although general bloodletting retained its popularity.[96] When the eastern practice of public steam baths was reintroduced into the West in the late sixteenth and early seventeenth centuries, cupping tended to be left in the hands of bath attendants (Bagnio men) and ignored by regular surgeons. Some surgeons, such as Pierre Dionis, who gave a course of surgery in Paris in the early eighteenth century, saw little value in the operation. He felt that the ancients had greatly exaggerated the virtues of the remedy.[97] Another French surgeon, René de Garengeot, argued in 1725 that those who resorted to such outdated remedies as cupping had studied the philosophical systems of the ancients more than they had practiced medicine. He accused the admirers of the ancients of wishing to kill patients "with the pompous apparatus of wet cupping." [98] (Figure 10.)

Nineteenth-century cuppers tended to blame the baths for the low status of cupping among surgeons. Dionis had described the baths in Germany as great vaulted halls with benches on two sides, one side for men and the other for women. Members of both sexes, nude except for a piece of linen around the waist, sat in the steamy room and were cupped, if they so desired, by the bath attendants. The customers' vanity was satisfied by making the scarifications (which left scars) in the form of hearts, love-knots, and monograms.[99] Mapleson's complaint against the baths in 1813 was typical of the reaction of the nineteenth-century professional cupper:

> The custom which appears to have become prevalent of resorting to these Bagnios, or Haumaums, to be bathed and cupped, appears to have superseded the practice of this operation by the regular surgeons. Falling into the hands of mere hirelings, who practiced without knowledge, and without any other principle than one merely mercenary, the

FIGURE 10.—Cupping in the bath, 16th century. (From a woodcut held by the Bibliotheque Nationale. Photo courtesy of NLM.)

operation appears to have fallen into contempt, to have been neglected by Physicians, because patients had recourse to it without previous advice, and disparaged by regular Surgeons, because, being performed by others, it diminished the profits of their profession.[100]

After a period of neglect, cupping enjoyed renewed popularity in the late eighteenth and early nineteenth centuries. In that period a number of professional cuppers practiced in the cities of Europe and America. Both Guy's and Westminster Hospitals in London employed a professional cupper to aid physicians and surgeons. Of these hospital cuppers, at least four, Thomas Mapleson, Samuel Bayfield, George Frederick Knox, and Monson Hills published treatises on the art of cupping, from which we gain the clearest account of cupping procedure.[101] Knox, who succeeded Mapleson as Cupper at Westminster Hospital, was petitioned by 59 medical and surgical students to write his practical and portable text.[102]

Instruments of the Professional Cupper

Cupping instruments in the eighteenth and nineteenth centuries were generally simple dome-shaped glass cups provided with thick rims so that the cups would be less painful when applied and removed. Cups were sold in various sizes, ranging from about 45 mm to 75 mm high. Some were made with a smaller diameter and a larger belly for cupping on parts of the body with a limited surface area. For the same reason, cups with an oval rim were recommended. (Figure 11.)

There were several common methods for exhausting cups, of which the simplest and most widely used was that of throwing burning lint or tow (the coarse part of flax, hemp, or jute) inside the glass before applying the glass to the skin of the patient. The professional cuppers vehemently disapproved of this clumsy practice, for the patient could easily be scorched.[103] Various improvements were suggested to avoid burning the patient. Dionis (1708) had recommended placing a small card with lighted candles over the scarifications, and then applying the cup.[104] Other methods included the brief introduction of a wire holding a bit of sponge soaked with alcohol and ignited, or attaching a bit of sponge to the inside of the glass by means of wax and a piece of wood. All such methods were deemed "clumsy expedients" by professional cup-

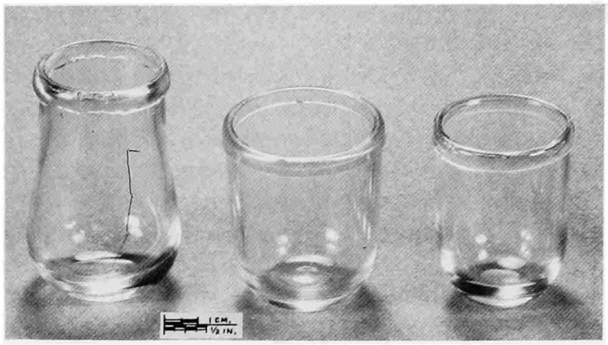

FIGURE 11.—Typical glass cupping cups, late 19th century. (NMHT 152130 [M-4766-68]; SI Photo 61135-C.)

pers,[105] who preferred to employ a lamp or torch especially made for cupping. Eighteenth-century surgical texts illustrated brass grease lamps with covers to regulate the flame. Probably less difficult to maneuver was the alcohol lamp first introduced in the 1790s. Alcohol lamps for cupping were made of metal, shaped like teapots, and contained a heavy cotton wick protruding from the spout.[106]

Although Mapleson (1813) employed an alcohol lamp, the cuppers writing after him preferred the more recently-introduced cupping torch. This consisted of a piece of hollow metal tubing cut obliquely at one end and provided with a metal bulb or ring at the other end. A cotton wick was stuffed as compactly as possible into the tube so that a small piece of wick protruded from the oblique end. The wick was dipped in alcohol, ignited, and inserted briefly into the cup. The torch was more convenient than the older teapot lamp because it was easier to insert into the cup, and was small enough to hold in the hand at the same time as one held the scarificator.[107]

The introduction of the scarificator represented the major change in the art of cupping between antiquity and the nineteenth century. Unlike later attempts at improving cupping technology, the scarificator was almost universally adopted. Previous to its invention, the cupper, following ancient practice, severed the capillaries by making a series of parallel incisions with a lancet, fleam, or other surgical knife.[108] This was a messy, time consuming, and painful procedure. Ambroise Paré (1510?–1590) was the first to employ the word "scarificator" and the first to illustrate a special instrument for scarification in his compendium of surgical instruments.[109] However, a precursor to the scarificator had been suggested by Paulus of Aegina (625–690), who described an instrument constructed of three lancets joined together so that in one application three incisions could be made in the skin. The instrument, recommended for the removal of coagulated blood in the wake of a blow, was considered difficult to use and was not generally adopted.[110] Paré's scarificator had a circular case and eighteen blades attached to three rods projecting from the bottom. A pin projecting from the side may have served to lift the blades and a button on the top to release them although Paré did not describe the spring mechanism.[111] Paré did not recommend the instrument for cupping, but rather for the treatment of gangrene. Several sixteenth- and seventeenth-century surgical texts made reference to Paré's instrument, among them Jacques Delechamps (1569) and Hellkiah Crooke (1631).[112]

It is not known who made the first square scarificator and adapted it to cupping. The instrument was not found in Dionis (1708), but it did appear in Heister (1719) and in Garengeot (1725). Thus it appears that the scarificator was invented between 1708 and 1719. Garengeot disliked cupping in general and he had little good to say of the new mechanical scarificator. "A nasty instrument," he called it, "good only for show."[113] The German surgeon, Lorenz Heister, was more appreciative of the innovation. After describing the older method of making sixteen to twenty small wounds in the skin with a knife, he announced that "The modern surgeons have, for Conveniency for themselves and Ease to the Patient, contrived a Scarificator . . . which consists of 16 small Lancet-blades fixed in a cubical Brass Box, with a Steel Spring."[114] Heister noted that while Paré had used the scarificator only for incipient mortification, it was now "used with good success by our Cuppers in many other Diseases, as I myself have frequently seen and experienced."[115]

The earliest scarificators were simple square brass boxes, with cocking and release levers and 16 pointed blades. By 1780, illustrations in surgical works showed that the bottom of the scarificator was detachable. Thus, although the illustrations do not show the screw for regulating the height of the blade cover, provision may already have been made for adjusting the depth of cut of the blades.[116]

Square or German-style scarificators continued to be sold in Germany throughout the nineteenth century. The earlier models (late eighteenth, early nineteenth century) were frequently embellished with ornate decoration, and had pointed blades. Some were quite tall. A specimen dated 1747, in the Wellcome Medical Museum collection, is 14.4 cm high and 4.5 cm wide at the base. (Figure 12.)

FIGURE 12.—Lavishly decorated scarificator, 18th century. (Held by the Wellcome Institute of the History of Medicine, London. Photo courtesy of the Wellcome.)

The later models (mid- to late nineteenth century) were wider and plainer and had arched or crescent shaped blades (which made a cleaner lesion), but the internal mechanism remained the same. Square scarificators all had 16 steel blades that cut in the same direction and were arranged on three rods of five, six, and five blades respectively. At one end of each rod was a gear pinion. The cocking lever, protruding through an aperture at the top of the scarificator, broadened out into a flat plate with as many gear sectors as blade rods. The plate was held against the interior of the scarificator by a heavy support rod running the width of the scarificator, in such a way that the gear sectors of the cocking lever meshed with the pinions on the blade rods. Pulling up on the cocking lever turned the blades 180 degrees. A heavy flat cantilever spring, attached at one end to the bottom of the case, was caught under a protuberance on the cocking lever and bent as the cocking lever was pulled. As the blades were turned, a catch slipped over a tooth on the cocking lever, and held the blades in place. Nineteenth-century octagonal scarificators generally had two catches, the first exposing the blades, and the second rotating them a full 180 degrees. Pressure on the release lever pushed the catch off the tooth on the cocking lever, thereby releasing the lever and allowing the spring to snap the apparatus back to its original position. Releasing the spring brought the blades around so quickly that their movement could not be seen. (Figure 13.)

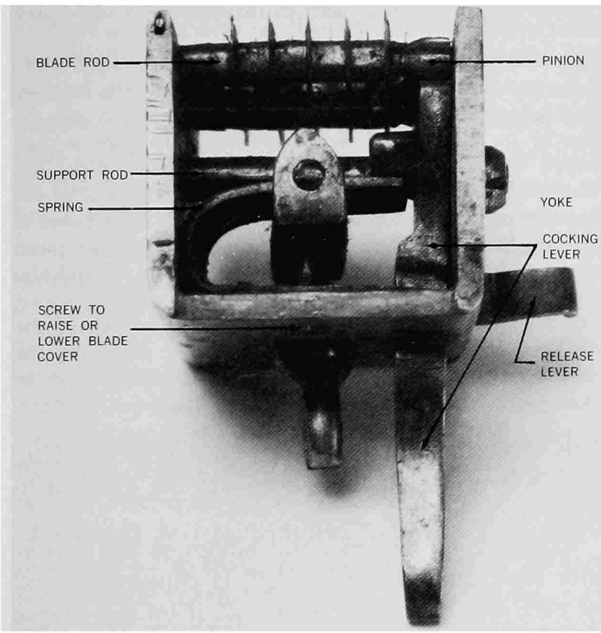

FIGURE 13.—Interior of square scarificator. (NMHT 152130 [M-4771]; SI photo 76-9111.)

In the square scarificators, the top and two sides were detachable from the bottom and the other two sides. Turning the wing-tip nut on the top of the scarificator lowered, by means of a yoke, the bottom of the scarificator that was fitted by grooves into the top. By raising and lowering the bottom, one could regulate the length of blade protruding beyond the bottom, and hence the depth of cut.

In the 1790s, the octagonal scarificator that was to become the standard English-American model began to appear in surgical texts. The early octagonal scarificator, as illustrated in Latta (1795) and Bell (1801), had sixteen rounded blades arranged as in the square scarificator, an iron triggering lever similar to that of the square scarificator, a button release on the side, and a flat key on top for regulating depth of cut.[117] Early in the nineteenth century the flat keys were replaced by round screws. Only the bottom or blade cover of the octagonal scarificator was detachable. In some of the octagonal scarificators, the round screw on top ran the height of the scarificator and screwed directly into an internally threaded post inside the blade cover. In other scarificators, the screw raised and lowered a yoke whose two sides were attached by additional screws to side projections of the blade cover.

A notable improvement was made in the early nineteenth century when John Weiss, a London instrument maker, introduced a 12 blade octagonal scarificator whose blades, arranged on two rods or pinions, were made to cut in opposite directions. This advance was mentioned by Mapleson in 1813 and adopted by London professional cuppers thereafter. The advantage of the innovations was that the skin was thereby stretched, and a smoother, more regular cut could be made. Weiss's Improved Scarificator also featured blades that could easily be removed for cleaning and repair. In place of two rows of six blades, one could insert a single row of four blades to adopt the scarificator for cupping on small areas such as the temple.[118] The feature of inserting a pinion with clean and sharp blades permitted the cupper to own only two scarificators. For cleansing the blades the manufacturer supplied a thin piece of wood covered with wash leather or the pith of the elder tree.[119]

Scarificators in which the blade rods turned in opposite directions (called "reversible" scarificators in trade catalogs) were more complicated to manufacture and therefore somewhat more expensive than unidirectional scarificators. The cocking lever meshed directly with only the first blade rod. To make the second blade rod turn in the opposite direction, an extra geared plate (or idler lever) was necessary to act as an intermediary between the cocking lever and the second blade pinion. The cocking lever turned the idler lever, which then turned the second pinion. Two support rods and two cantilever springs were needed in place of the one in unidirectional scarificators.

The brass, octagonal scarificator with 8, 10, and particularly 12 blades became the standard scarificator sold in England and America.[120] Both unidirectional ("plain") and reversible scarificators were offered through trade catalogs. Smaller octagonal scarificators with four to six blades were sold for cupping parts of the body with limited surface area.

Cupping Procedure

The art of cupping, it was generally agreed, required a high degree of dexterity that could be maintained only by constant practice. Professional cuppers were concerned with avoiding any appearance of clumsiness, else the patient might come to fear an operation essential to his health. In the hands of an inexperienced physician or surgeon, cupping could be highly painful to the patient, and yet fail to produce the requisite amount of blood. While expert cuppers were usually available in cities, the rural doctor was not trained in the operation. It was to these rural practitioners that the treatises of the professional cuppers were addressed. One cupper, George Frederick Knox, offered in addition personal instruction in cupping procedures. His charge was a guinea for medical students and three guineas for non-medical students for a three month course.[121]

Physicians and surgeons took a renewed interest in cupping in the early nineteenth century. Cupping was no longer regarded as merely a useful substitute for bloodletting. Recent physiological research seemed to prove to the advocates of cupping that the effects of slow withdrawal of blood from the capillaries produced a different effect on the constitution than the quick withdrawal of blood from a vein. Thus, Knox was convinced by the results of this research that, while phlebotomy was indicated in cases of high fever, "particular phlegmasiae" specifically required the intervention of cupping.[122]

The procedure that the experts followed in wet cupping was as follows. First, the cups were immersed in hot water. Bayfield recommended that one glass be used for every four ounces of blood required. Thus, to abstract 18 to 20 ounces, as was common in cupping on the back or abdomen, four or five glasses were needed. The spot chosen for placement of the cups should be free of bone, but also not overly fatty. Cupping over the belly of a muscle was especially recommended. After the spot was fomented with hot water, the torch was dipped in alcohol, lit, and inserted into the cup for about two seconds. Once the torch was removed, the cup was allowed to sink of its own weight into the skin. During the minute that the skin was allowed to tumefy under the cup, the scarificator was warmed in the palm of the hand in preparation for the most difficult part of the operation. It required great skill to manage torch, scarificator, and cups in such a way as to lift the cup, scarify, and recup before the tumefaction had subsided. Monson Hills (1834) described the manipulations involved thus:

> The torch is held in and across the palm of the right hand, by the little and ring finger, leaving the thumb, the fore and middle fingers free to hold the scarificator, which may be done by the thumb and fore finger only; the glass is then grasped by the thumb, fore and middle fingers of the left hand, leaving the little and ring fingers free; the edge of the glass is then detached from the skin by the middle finger of the right hand; the scarificator being set, care must be taken not to press upon the button with the thumb too quickly; directly the glass comes off, we apply the scarificator, spring it through the integuments, and then placing it between the free little and ring fingers of the left hand, we apply the torch to the glass, and glass to the skin over the incisions, as before recommended.[123]

Hills recommended practicing on a table, "taking care, of course, that the lancets are not allowed to strike the table."

According to Bayfield, the blades of the scarificator were generally set at ¼″. If cupping behind the ears, they should be set at $\frac{1}{7}$″, if on the temple at ⅛″, and if on the scalp at ⅙″. When the cups were two-thirds full, they were removed and reapplied if necessary. This, too, was no easy task. One had to manipulate cup and sponge deftly in order to avoid spillage. Cupping was to be not merely a neat operation, but an elegant one. After cupping, the wound was dabbed with alcohol or dressed, if necessary. Scarificator blades could be used some twenty times. After each use, the scarificator was to be cleaned and greased by springing it through a piece of mutton fat.[124]

A great variety of bodily parts were cupped, just about any part that had sufficient surface area to hold a small cup in place. Knox, for example, gave directions for cupping on the temple, back of the head, behind the ears, throat, back of the neck, extremities, shin, chest, side, abdomen, back and loins, back of the thighs, perineum, sacrum, and on buboes.[125] In reply to those who wondered if cupping hurt, Knox asserted that "those who calculate the pain incurred in cupping by comparison with a cut finger are very much deceived." The scarificator itself produced little pain, he claimed, but he admitted that the pressure of the rims of the glasses could cause a degree of discomfort.[126]

Nineteenth Century Attempts to Improve Cupping Technology

The story of nineteenth-century attempts to improve cupping technology is an interesting one, in that a great deal of effort was expended on comparatively short-lived results. For those who were adept at cupping, the cups, torch, and standard scarificator were quite adequate. Innovations were thus aimed at making the operation more available to the less practiced. The new gadgets could not rival the traditional instruments in the hands of an experienced cupper, and, moreover, they were usually much more expensive.

Most of the attempts at innovation centered in eliminating the need for an alcohol lamp or torch to exhaust the cups. As far back as Hero of Alexandria, we find directions for the construction of "a cupping-glass which shall attract without the aid of fire." Hero's device combined mouth suction with a system of valves. Another famous inventor of assorted devices, Santorio Santorii (1561–1636), described a cup that contained a syringe in the early seventeenth century.[128] From the 1780s on, cups with brass syringes began to appear in compendia of instruments. A cup with brass fixings would be screwed onto a brass pump, placed on the skin, and the air within removed by a few strokes of the piston.[129] This sounded better in theory than it worked in practice. Expert cuppers agreed that they thoroughly disliked using the syringe. Mapleson (1813) offered three strong objections to the instrument. First, exhaustion could easily be carried too far, so as to obstruct the flow of blood. Second, the operation become tedious and fatiguing to the bloodletter because of the repeated screwing and unscrewing of syringe and glasses. Third, the valves were liable to malfunction.[130] Twenty-three years later Knox continued to disapprove of the syringe for the very same reasons. Of all the new inventions for cupping, he declared in 1836, "the worst is the syringe, as it makes that a most complicated and bungling operation that which, with common care and attention is one of the most simple in surgery."[131]

Despite rejection by experienced cuppers, manufacturing of an air-tight syringe continued to challenge inventors throughout the nineteenth century. Some attempted to substitute stopcocks for valves, and some to place long flexible tubes between pump and glasses so that the pumping motions would not be communicated to the patient. Pumps were gradually improved, and, although rarely recommended by experts, were sold in great numbers as part of fancy and expensive cupping sets. These sets, with prices as high as fifteen dollars, consisted of a mahogany or leather box with brass latches, lined in plush, and containing compartments for scarificators, a brass pump, and an assortment of glasses provided with metal attachments. Some of the most elegant of the cupping sets were those made by Maison Charrière of Paris. Today the luxury of these cupping sets seems rather incongruous with the bloody purposes for which the instruments were used. Yet, the beauty of the instruments and their containers must have added to the esteem of the physician or surgeon in the mind of the patient.

Syringes were not only useful in cupping but also were employed in a wide variety of medical and surgical operations. Creating an all-purpose syringe that would extract or inject liquids into any part of the body was yet another inventor's dream. Two of the earliest English surgical patents were awarded to two such syringes. John Read (1760–1847), surgical instrument maker for the British Army and the East India Company, patented a pump in 1820 for use in "extracting poison from the stomach, administering clysters, introducing tabacco fumes into the bowels, transfusion of blood, draining off the urine, injecting the bladder, female injection, anatomical injection, administration of food and medicine, cupping, drawing the breasts . . . &c."[132] John Weiss, inventor of the improved scarificator, invented his own patent syringe in 1825, which he claimed to be superior to all previous syringes because it employed stopcocks in place of valves, which were subject to leakage and clogging. Cupping was only one of many operations that could be performed with its aid. The Truax Surgical Pump is an example of a late nineteenth-century all-purpose patent pump outfit that included cups among its numerous optional attachments.[133] (Figure 14.)

Those who went a step further in their efforts to improve cupping procedure attempted to combine cup, lancet, and exhausting apparatus all in one instrument. Bayfield described and rejected several such devices in 1823, including perhaps the earliest, that of the Frenchman, Demours. Demours' instrument, first introduced in 1819, consisted of a cupping glass with two protruding tubes, one containing a lancet, and the other an exhausting syringe. The lancet, surrounded by leather to keep air out of the cup, could be supplemented by a cross with four additional blades, if more than one puncture was desired.[134] In 1819, Thomas Machell, a member of the Royal College of Surgeons in London, described a similar apparatus in which the glass cup was separated from the tin body of the apparatus by a flexible tube. The facility and precision of the instrument, claimed Machell, "are incalculably surpassed by the power of its application to any part whatever of the surface, under any circumstances indicating its propriety, and by any person untrained to the manual dexterity of a professed cupper." [135]

Professional cuppers who took pride in their skill naturally avoided such novelties. Bayfield found the complex instruments objectionable because even "the most trifling degree of injury is generally sufficient to render the whole apparatus useless." [136]

The Smithsonian collection contains two patent models of American wet cupping devices. The first is an ingenious cupping set patented by a Philadelphia navy surgeon, Robert J. Dodd, in 1844. It consisted of a metal syringe provided with a plate of lancets that screwed on to a glass tube with a protuberance for collecting blood. The most interesting feature of the apparatus was the provision made for cupping internal parts of the body such as the vagina, throat, or rectum. One could attach to the pump either a curved or a straight tapering glass tube, seven to eight inches long, and corresponding flexible metal lancet rod. The pump could also be adapted for extracting milk from the breasts of women by attaching a metal cap with a hole just large enough to accommodate the nipple.[137] The second patent model is that of W. D. Hooper of Liberty, Virginia, who invented in 1867 an apparatus combining cup, pump, and scarificator. The novel part of the instrument was the tubular blades that were injected into the flesh and then left in place while the blood was being removed, "by which means the punctures are kept from being closed prematurely, as frequently happens with the ordinary device." [138]

It is unlikely that any of these ingenious devices were marketed in quantity. For those skilled in the art of cupping, the torch, cups, and scarificator were more effective. For those not experienced in the art, the new devices were simply too expensive, inconvenient to carry about, and fragile. While doubtless some surgeons bought fancy equipment in order to impress their patients, other surgeons, and the professional cuppers, realized that expensive and unfamiliar gadgets could inspire more dread than awe, especially among rural patients. The cupper Monson Hills advised his readers:

> A person about to be cupped, is often needlessly alarmed by the arrival of his operator, with a capacious box of instruments; and he measures the severity of the pain he is about to undergo, by the seeming multitude of instruments required to inflect it. If, on the contrary, the few implements used are carried in the pocket, and produced when about to be used, unobserved by the patient, this evil is easily avoided.[139]

In seconding Hills' sentiments, W. A. Gillespie, the Virginia country physician mentioned earlier, went a step further. Gillespie felt that the rural physician could dispense with the glass cups, torch, and scarificator and substitute in their place a simple thumb lancet and cow's horn. Not only would these instruments save money, but they would also "excite less dread in the mind of the patient than a formidable display of numerous and complicated instruments." [140]

Some inventors concentrated on more modest improvements in cupping technology, namely, modification of cups and scarificators. One of the simplest improvements was that of Dr. Francis Fox, House Surgeon to the Derbyshire General Dispensary. In 1827, Dr. Fox introduced a new glass cup with a short, curved, wide neck and an oval belly that hung downwards. When applied to the skin, the glass hung in the manner of a leech, and so the

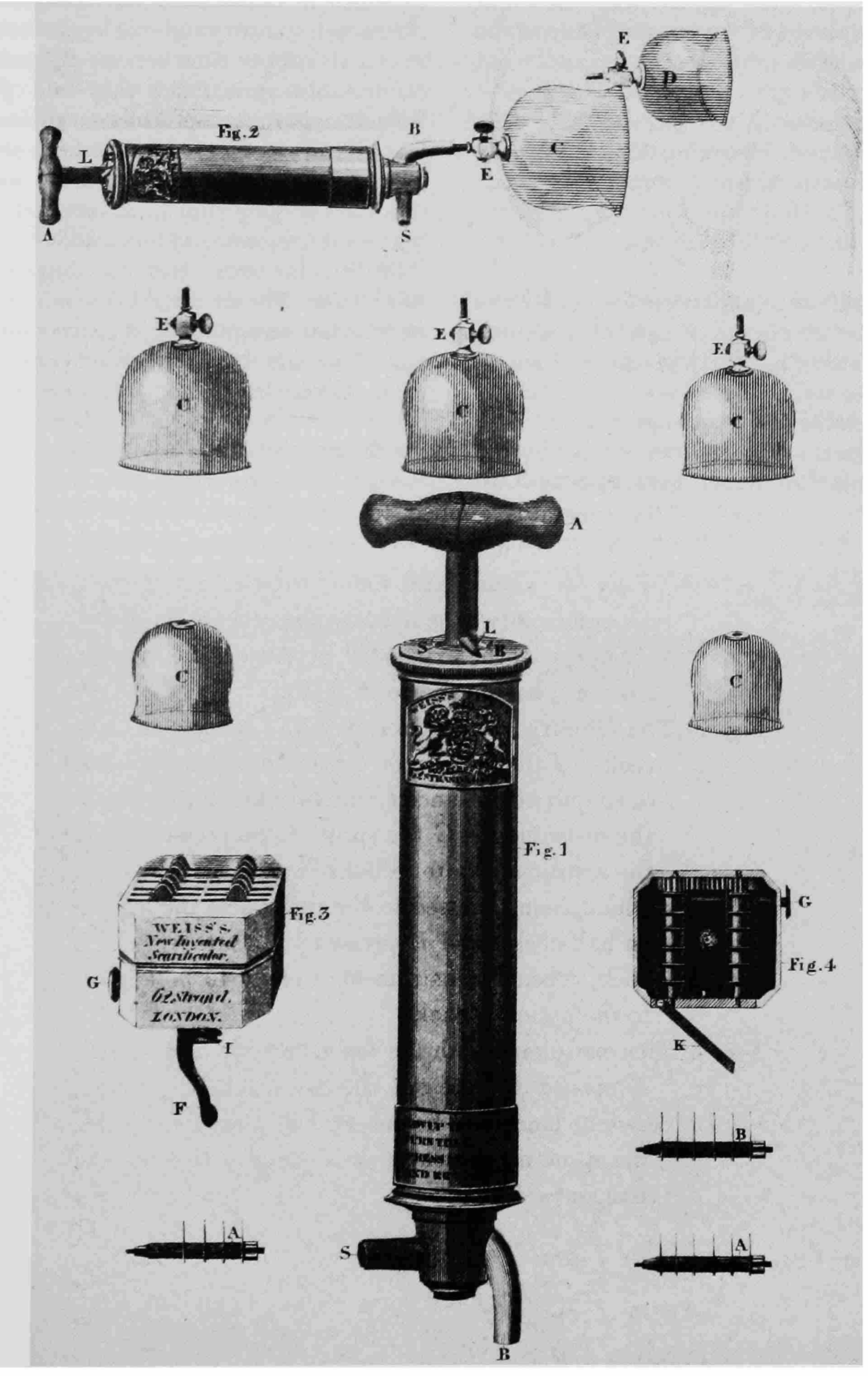

FIGURE 14.—Weiss's improved patent cupping apparatus. Illustrated are Weiss's patent syringe applied to cupping and Weiss's improved scarificator. (From John Weiss, *Surgical Instruments,* 2nd edition, London, 1831. SI photo 73-5184.)

glass was called "The Glass Leech." Since the burning tow could be placed in the hanging belly of the glass, away from the skin, it was easier to apply and remove the ordinary cup.[141] Other modifications of the cupping cup included the addition of a stopcock to let the air back in, graduations to measure the blood, and the attachment of a metal bar inside the cup in order to hold the burning sponge or wick away from the body of the patient.[142] (Figure 15.)

The most significant innovation in cups came with the manufacture of cups of vulcanized rubber in the 1840s. Rubber cups could be easily exhausted without need of a torch, and they were far cheaper and easier to manipulate than cups attached to a pump. Most surgical catalogs in the late nineteenth century offered both all-rubber cups and glass cups to which a rubber bulb was attached. In the late nineteenth century, sets of cups were sometimes sold with rubber rims because the rubber fit more comfortably against the skin and prevented air from entering the cup. Museum collections contain few rubber cups because nineteenth-century rubber tended to deteriorate in time. However, the appearance of these cups in all surgical catalogs indicates that they were widely sold.[143]

Several inventors tried to improve upon the scarificator. The defects of the ordinary scarificator were widely recognized. It was too bulky and heavy, and it cost too much—the most inexpensive scarificator offered by George Tiemann & Co. in 1889 cost $4.50.[144] A strong hand was required to trigger the blades, and when the trigger was released, the force of the spring was so great that the lever moved

FIGURE 15.—Fox's glass leech. Cupping set contains two hanging "glass leeches," a scarificator, a bottle of alcohol, and a torch with a ring handle such as the cupper Knox recommended. (Set held by the Academy of Medicine, Toronto. Photo courtesy of the Academy.)

back with great force and produced a loud, unpleasant click. The force of the lever moving against the case of the scarificator made it impossible to use any but expensive materials (brass and German silver) in making the scarificator casing. Furthermore, the springs were liable to break. Finally, the scarificator was difficult to clean.[145] Late in the century, when sterilization became important, some cuppers went back to the lancet because the scarificator could not be surgically cleansed. The surprising thing is, that despite all the defects, the same scarificator was sold in 1930 as in 1830. Either the claims of the inventors of improved scarificators were unjustified, or cuppers were unwilling to try novel instruments in what was becoming an old-fashioned and increasingly less popular operation. (Figure 16.)

A few British and American surgical supply companies sold special models of scarificator, but always in addition to the common scarificator. The special models were generally higher in price. For example, the Englishman, James Coxeter, announced in 1845 a new scarificator with a rotating lever on the side instead of a cocking lever on the top. The roto-lever, according to Coxeter, could be turned to set the scarificator by a child of six. Furthermore, the scarificator was so constructed that when the spring was released only internal parts moved. There was no lever that snapped back and no resounding click. This special model of scarificator continued to be sold by Coxeter and Son (London) until late in the nineteenth century.[146]

Coxeter did not patent the roto-lever scarificator. In fact, through 1852 there were no British patents on scarificators. In contrast, there were eight French patents on scarificators before 1860.[147] Of these, the most important was the 1841 patent of Joseph-Frédéric-Benoit Charrière (1803–1973), a Swiss-born cutler who founded a major surgical supply company in Paris. Charrière's octagonal scarificator substituted two flat coiled springs (like watch springs) for the two cantilever springs normally found in "reversible" scarificators. One end of each coiled spring was attached to the scarificator casing and the other to one of the support rods. As the cocking lever was pulled, the support rods turned and wound the springs more tightly about the rods. According to Charrière, these springs were more efficient and less likely to break than the ordinary springs.[148]

Charrière's company later employed the coiled springs in the making of a circular scarificator. The circular scarificators, associated particularly with French manufacture, were the most elegant of nineteenth-century scarificators and a fitting complement to the Charrière cupping sets.[149] They were generally not sold by British and American surgical supply companies, but a number of them appear to have reached the hands of American physicians.

In America, there were five patents on scarificators, of which the Smithsonian possesses three patent models. The most significant American patent was that of George Tiemann in 1846. Tiemann's scarificator had a flattened base and an ebony handle, which contained a coiled spring. The blades were moved by a rack and pinion mechanism, and triggered by a knob at the end of the handle. The advantages claimed by the inventor were ease in handling, ease in cleaning, and the diagonal cut of the blades that allowed the blood to flow more freely and the wounds to heal more readily. Tiemann & Co. was still selling their patent scarificator as late as 1889 for a price of $7.00.[150] The Smithsonian possesses a marketed version in addition to the patent model.

The two other patent scarificators in the Smithsonian collection were both invented by Frederick M. Leypoldt of Philadelphia. The first, patented in 1847, was similar in external appearance to the common scarificator. The novelty consisted of a new arrangement of the cocking lever and cantilever spring that allowed use of a lighter and cheaper casing. Although the patent model was made of brass, Leypoldt claimed that with his improvements in the internal mechanism, the case could, with safety, be made of tin.[151]

Leypoldt's second patent, issued in 1851, was for a scarificator with a greatly simplified inner mechanism allowing for a substantially smaller and lighter case. The cocking lever was placed horizontally in the casing and engaged the blade rods through a rack and pinion mechanism. According to Leypoldt, this scarificator was more convenient, more portable, cheaper, safer, and more reliable than the common scarificator.[152] Leypoldt probably marketed his scarificators, there being in the Smithsonian collection other bloodletting instruments with his name, but he did not form a major surgical supply company as did George Tiemann.

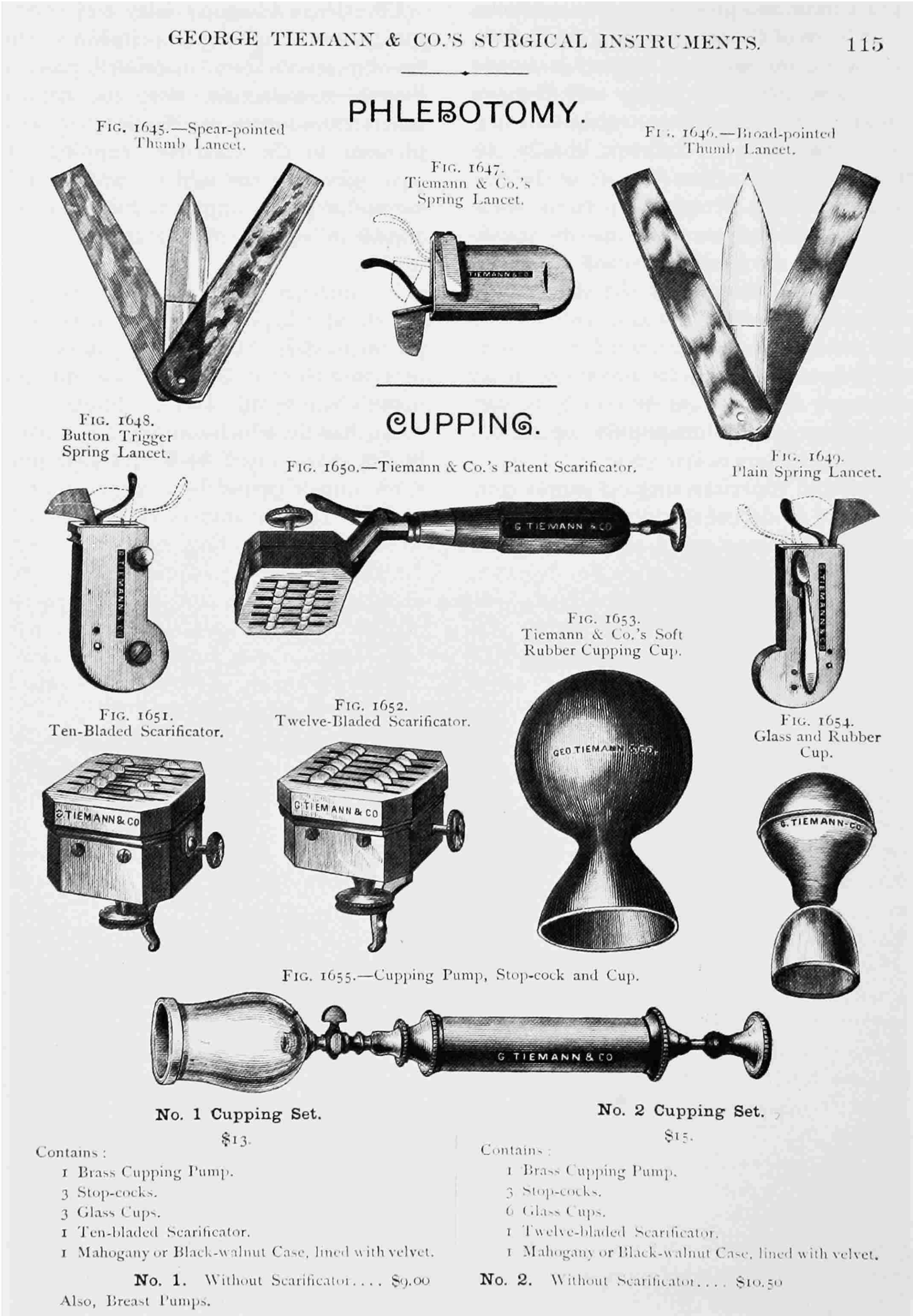

FIGURE 16.—Advertisement for phlebotomy and cupping instruments. Note the rubber cups. (From George Tiemann & Co., *American Armamentarium Chirurgicum,* New York, 1889. SI photo 76-13542.)

After 1860, interest in inventing new scarificators declined as wet cupping decreased in popularity. The improved cups and scarificators, while they had achieved a limited success, had still failed to supplant the common octagonal scarificator and the plain glass cup. As interest in wet cupping declined, medical attention shifted to the therapeutic virtues of dry cupping. Dry cupping offered even greater opportunities for inventors, who sought means to bring the effects of the vacuum to more areas of the body for greater lengths of time.

Dry Cupping

Dry cupping, in its simplest form, was said to act as a "revulsive" or "derivant." By the nineteenth century these once hotly debated terms had become nearly interchangeable in discussions of cupping. In cupping for revulsive purposes, one cupped on a distant part to relieve excess of blood in the affected part. In applying cupping as a "derivant," one cupped closer to the affected part. In either case, the source of pain was presumed to be somewhere below the skin, and the pain was relieved by bringing blood away from the affected part to the surface of the body. Thus, one nineteenth-century cupper concluded, revulsion was only derivation at a distant point.[153]

If dry cupping was applied for ten minutes or longer so that the capillaries burst, the action of the cups was said to be that of a counter-irritant. According to ancient medical theory, the counter-irritant was a means of relieving an affected part by deliberately setting up a secondary inflammation or a running sore in another part. Counter-irritations were traditionally produced in a number of ways, among them, blisters, cautery, setons, moxa, and dry cupping.[154]

One of the most popular counter-irritation devices commonly associated with cupping instruments in catalogs of surgical goods, was Baunscheidt's *Lebenswecker,* sold by most American surgical supply houses in the second half of the nineteenth century. The *Lebenswecker,* or "Awakener of Life," was the mainstay of the mystical medical system known as *Baunscheidtismus,* after the founder of the device, Carl Baunscheidt of Prussia (1809–1860).[155] The system apparently gained much notoriety in Germany, England, and America, for Baunscheidt's book went through ten German editions and several British and American editions. At least two Americans patented improvements on the *Lebenswecker.*[156] The device was made of ebony, about 250 mm long, and contained a coiled spring attached to a handle. At the other end of the spring was a place about 20 mm in diameter, with about thirty projecting needles. By pushing upon the handle, one sent the needles into the skin. The ability of the instrument to create blisters was enhanced by the application of Baunscheidt's special oil to the irritation (Figure 17).

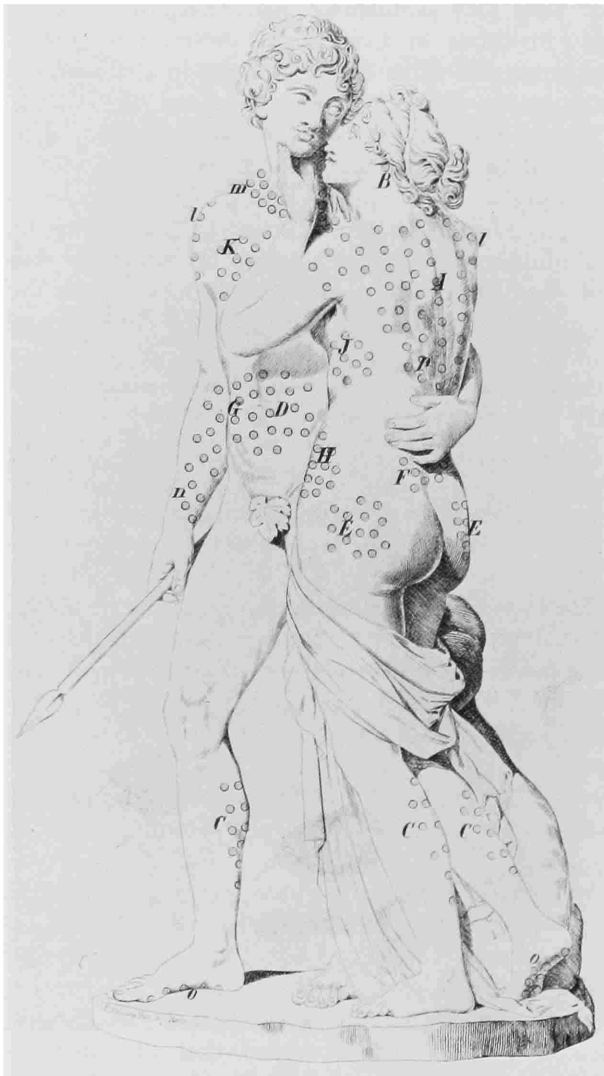

FIGURE 17.—Venus and Adonis with marks showing where Baunscheidt's *Lebenswecker* should be applied. (From Carl Baunscheidt, *Baunscheidtismus, by the Inventor of the New Curing Method,* Bonn, 1859(?). Photo courtesy of NLM.)

Dry cupping stimulated much theoretical debate in the nineteenth century as well as a number of physiological experiments.[157] Although physicians generally agreed that dry cupping had curative value if employed properly, they disagreed widely on when to employ the remedy, and on the manner in which the remedy operated. Did application of cups affect only the surface vessels, or could cupping affect the entire nervous system, and through the nerves, the action of the secretory organs? Were the effects of dry cupping of only a temporary nature, or were they permanent? An interesting series of investigations in Europe and America sought to ascertain the value of dry cupping in checking the absorption of poison. An American, Dr. Casper Wistar Pennock, replying to investigations performed by Martin Barry, an Edinburgh physician residing in Paris, carried out an impressive series of physiological experiments in 1827, in which he administered strychnine and arsenic under the skin of dogs and rabbits and then cupped over the wounds. He concluded that while dry cupping prevented almost certain death from the poisons, once the cups were removed, death would ensue, unless the poisons were surgically removed.[158]

Interest in dry cupping led to attempts to apply the therapeutic effects of the operation to larger areas of the body than could be accommodated by a cup. In France, Victor-Théodore Junod (1809–1881) adapted cupping to entire limbs. Shortly after receiving his degree in medicine in 1833, Junod presented at the Academy of Sciences his apparatus, known thereafter as Junod's boot. Junod believed that actual extraction of blood was a dangerous remedy and that the benefits of bleeding might as easily be obtained by his "derivative method," which withdrew blood from the general circulation but allowed it to be returned at will. Junod's boot and Junod's arm, which sold for as much as $25.00 apiece,[159] were constructed of metal and secured against the limb by a silk, and later a rubber, cap. To the boot was attached a flexible tube, stopcock, pump, and if desired, a manometer for measuring the vacuum produced. In chronic illnesses, Junod recommended that the boot be applied for an hour. So much blood was withdrawn from the circulation by use of the apparatus that the patient might easily faint. To explain how his boot worked, Junod invented a theory that he called "hemospasia," meaning the drawing of blood.[160] This was typical of a number of attempts to introduce sophisticated terminology into discussions of traditional remedies. Junod's arm and boot were widely available through American surgical supply companies. As late as 1915, Heinrich Stern, previously mentioned as a latter-day proponent of bloodletting, had no doubt that application of the boot to the foot would relieve congested states of the abdominal viscera.[161] (Figure 18.)

Americans patented a number of modifications of the arm and boot, and in addition they patented a number of whole body devices called "depurators." Junod had introduced such a device along with his boot—a metal casing in which a patient would be placed leaving only his face showing. The air inside would then be exhausted by means of a gigantic syringe. In America such "depurators" may have been regarded more as quackery than as a legitimate extension of cupping, for despite the fact that Americans patented some twenty of these devices, surgical supply houses did not sell them and little was written about them.

In the last decade of the nineteenth century, Dr. August Bier, professor at the University of Bonn, developed another sophisticated theory supporting the use of blood-suction devices, known as the theory of hyperemia, meaning "excess of blood." According to the doctrine, lesions are always accompanied in nature by hyperemia, "the most widespread of auto-curative agents." [162] If we, therefore, wish to imitate nature, we create an artificial hyperemia. Bier recommended several means of increasing the blood supply of an affected part, including hot-air baths, suction devices such as Junod's boot, and dry cupping. Several American surgical suppliers sold Bier's Hyperemic Cups in the early twentieth century. These were glass cups, of a great variety of shapes and sizes including some with curved rims, each fitted with a rubber tube and bulb for exhausting the air. A major function of these cups was to collect wound secretions from boils or furuncles.[163]

Breast Cupping

Related to cupping by its technology is the practice of drawing milk from the breasts by means of breast pumps. Mothers with underdeveloped or inflamed breasts posed a frequent problem for the nineteenth-century physician, who treated them

FIGURE 18.—Junod's boot applied to a baby in the cradle. (From Victor Theodore Junod, *A Theoretical and Practical Treatise on Maemespasia*. London, 1879. Photo courtesy of NLM.)

with either large doses of tartar emetic, a strong purgative, or with cupping.[164] Breast pumps were small glass cups with fluted edges made to accommodate the nipple. While some surgeons, as the American Samuel Gross, recommended using a bottle with a long neck in which the air had been rarified by means of hot water,[165] most breast pumps were exhausted by mechanical means. For reasons of modesty, the pumps were usually designed so that the woman could draw her breasts herself. Perhaps the simplest design of a breast pump was a glass cup having a long spout extending in such a way that the woman could perform suction herself. Such all-glass cups were illustrated in the eighteenth century.[166] A few, reputedly made centuries earlier, are found in the Wellcome Historical Medical Museum. Early in the nineteenth century, breast pumps, just as glass cups for bleeding, were attached to brass syringes, and were often included among the variety of cups in cupping sets provided with syringes. Read's and Weiss's patent syringe as well as Thomas Machell's cupping device were adapted for breast pumping. With the invention of vulcanized rubber, the breast pump was frequently attached to a large rubber bulb. A glass protuberance was often added to pumps exhausted by syringes or rubber bulbs, in order to collect the milk so that it could be fed to the infant. In the 1920s some breast pumps were attached to electric motors.[167] Breast pumps have continued to be employed up to the present day. Of all instruments employing the principle of the cupping device, breast pumps were the most frequently patented. From 1834 to 1975, more than 60 breast pumps were patented, the majority in the period from 1860 to 1920.[168]

The Decline of Cupping

Cupping died out in America in the early twentieth century, but its disappearance was gradual and scarcely noticed. Some of the most complex of cupping devices were invented in a period when most physicians regarded cupping as ineffectual. Patents for cupping devices continued to be issued as late as 1916 when Joel A. Maxam of Idaho Springs, Colorado, patented a motorized pump, which by means of various sizes of cups, could subject a part of the patient's body to either a prolonged suction or a prolonged compression.[169] One of America's last advocates of bloodletting, Heinrich Stern, writing in 1915, also advocated the use of an electrical suction pump to evacuate cups. With an electric motor, he declared, one could prolong hyperemia for 15, 30, or more minutes.

Stern also invented a theory to account for the therapeutic effects of his inventions, namely, the theory of phlebostasis. Instead of pumping air out of a device, Stern pumped air into a device, for the same purpose of removing a portion of blood from the general circulation. His "phlebostate," manufactured by Kny-Scheerer of New York, was quite similar to a sphygmomanometer. It consisted of a set of cuffs that fit about the thighs, rubber tubes, a manometer, and a suction bulb or an electric force pump. For stubborn cases, such as migraine headaches, Stern recommended using the cuffs for 30 minutes or more. To facilitate the application of the cuffs, Stern invented a "phlebostasis chair," one of the most complex "cupping" devices ever made. Like an electric chair, the phlebostasis chair was supplied with cuffs for both arms and legs. Air was pumped into the cuffs by means of an electric motor. According to Stern, compression of the upper segment of both arms withheld 300 cc of blood from circulation, while compression of the thighs withheld as much as 600 cc.[170]

In addition to these sophisticated devices, simple cupping, especially dry cupping, continued well into the 1930s. Although cupping was no longer generally recommended by physicians, most surgical companies advertised cups, scarificators, and cupping sets in the 1920s and even the 1930s. The last bastions of cupping in the United States were the immigrant sections of large cities. In the lower East Side of New York, in particular, cupping was still flourishing in the 1920s. By then cupping was no longer performed by the physician, but had been relegated back to the lowly barber, who advertised in his shop window, "Cups for Colds."[171]

Leeching

Leeches

The word "leech" derives from the Anglo-Saxon *loece,* "to heal." Thus, the Anglo-Saxon physician was called a "leech" and his textbook of therapeutic methods a "leechdom." The animal itself was already known to the ancients under its Latin name *hirudino*. It appears, however, that the introduction of leeches into Western medicine came somewhat later than that of phlebotomy or cupping, for Hippocrates made no mention of them. The earliest references to the use of leeches in medicine are found in Nicander of Colophon (2nd century B.C.) and in Themison 1st century B.C.). Thereafter they were mentioned by most Greek, Roman, and Arabic medical writers.[172]

The leech is a fresh-water parasitic invertebrate belonging to the Phylum Annelida. On one end of its worm-like body is a large sucker by which the animal fastens itself to the ground, and at the other end is a smaller sucker, in the middle of which is a chitinous mouth that makes a triangular puncture. As items of *materia medica*, leeches were described in dispensatories, or compilations of medicaments, and sold by apothecaries, both to physicians and directly to patients. The species most commonly used for bleeding was *Hirudo medicinalis*, indigenous to the streams and swamps of Central and Northern Europe, and known in commerce as the Swedish or German leech. It was 50–75 mm long, with a dull olive green back and four yellow longitudinal lines, the central two broken with black. Somewhat less popular was the Hungarian leech, indigenous to Southern Europe. In addition, there was an American species of leech, *Hirudo decora*, which was gathered principally from the lower Delaware River, but, since it drew much less blood than the Swedish leech, it was regarded as greatly inferior.[173] Most American physicians imported their leeches. In the late nineteenth century, one could buy Swedish leeches for $5.00 per hundred.[174]

Leeches were gathered in the spring of the year either by means of a pole net, or, more primitively, by wading into the water and allowing the leeches to fasten themselves onto the legs. Sometimes horses and cattle were driven into the water to serve as bait for the leeches.[175] (Figure 19.)

FIGURE 19.—Lithograph published in London in 1814 showing three women gathering leeches by a stream. (NMHT 320033.08; SI photo 76-7741.)

Leeching, like other forms of bloodletting, enjoyed a revival in the early nineteenth century, particularly in France, where the doctrines of heroic medicine preached by Broussais[176] led to an increase of leech usage from about 3 million in 1824 to 41.5 million in 1833.[177] Leechers, although not as high in status as professional cuppers, practiced in many large cities, and numerous tracts were written on the care and breeding of leeches. "Leech farms" were unable to increase the leech supply to meet the rising demand, and most leechers complained of the scarcity and great expense of the little animals.[178]

Leeching and cupping each had their advocates. The major advantage of the leech over the cup was that the leech could be employed on almost any part of the anatomy, including around the eyes, in the mouth, the anus, and the vagina. In fact, leeching the internal membranes enjoyed quite a vogue in the early nineteenth century. Leeches were applied to the larynx and the trachea for bronchitis and laryngitis and for relieving the cough of phthisis. For inflammations of the conjunctiva (the membrane lining the eyelids) they were applied to the nasal membrances of the adjacent nostril, and for inflammations of the ear they were applied to the meatus of the ear and behind the ear. The French popularized the practice of leeching the anus to treat inflammations of the mucous membranes of the bowel. To prevent leeches from getting lost in the body cavities, Jonathan Osborne, a British physician, recommended in 1833 that a thread should be passed through the leech's tail. In addition, he invented a device, which he called a "polytome," specifically for introducing leeches into the rectum.[179] In the mid-nineteenth century, special leech tubes were widely sold for applying leeches to internal membranes.[180]

A second advantage of leeches over cupping was that leeches could extract blood more readily. Not only was dexterity not required in order to apply a leech, but also it was soon noticed that leech bites continued to bleed even after the leech let go, while scarificator incisions often coagulated before any blood was obtained. In 1884 it was shown by John Berry Haycroft, a Birmingham chemist, that this phenomenon was due to an anti-coagulant, now called "hirudin," that the leech injected into the blood.[181]

To apply a leech, the animal was first dried with a bit of linen, and the skin of the patient was prepared by washing with warm water and then shaving. To direct it to the right spot, the leech was often placed in a small wine glass that was inverted over the area to be bitten. Since leeches were sometimes perversely unwilling to bite, they were enticed by the placement of a bit of milk or blood on the patient's skin. Small children were given one or two leeches, and adults 20 or more. Broussais employed up to 50 leeches at one time.[182] The leech was usually allowed to drop off of its own accord when it had satiated itself, which took about an hour. Sometimes the tail of the leech was cut off so that it would continue to suck. Once used, leeches could not be reused for several months unless they were made to disgorge their meal by dropping them in salt water or weak vinegar. A healthy leech drew one or two fluid drachms of blood, and as much would flow after the leech had dropped off. Thus a good Swedish leech could remove about an ounce of blood. This quantity could be increased by employing a cupping glass over the bite.[183]

Leeches were kept in a glass container of water covered with gauze or muslin and placed in a cool, dark room. The water had to be changed frequently, as much as every other day in summer. Pebbles or moss were placed in the bottom of the vessel to aid the leech in removing the slimy epidermis that it shed every four or five days. In the nineteenth century leeches were often sold in drug stores from large, elegant containers with perforated caps. Actually, only the day's supply of the pharmacist's leeches was kept in the attractive storefront jars; the rest were kept out of sight. While most leech jars were simple white crockery pieces with "leeches" lettered in black on the front, some leech jars were over two feet tall and decorated with elegant floral and scroll work. Among the most ornate leech jars were those made in Staffordshire, England.[184] (Figure 20.)

Artificial Leeches

One of the characteristics of nineteenth-century technology was the attempt to replace natural materials and processes by imitations and mechanisms. Considering the properties of the natural leech, it is no wonder that very early in the nineteenth century inventors began to seek a mechanical substitute. The disadvantages of the leech were many.

FIGURE 20.—Staffordshire leech jars, 19th century. (NMHT 263554 [M-11504]; SI photo 73-4231.)

Wrote one inventor of an artificial leech:

In the first place the appearance of the animal is repulsive and disgusting, and delicate and sensitive persons find it difficult to overcome their repugnance to contact with the cold and slimy reptile. This is especially the case when it is a question of their application about or within the mouth. Then again, their disposition to crawl into cavities or passages results sometimes in very annoying accidents. Another source of annoyance is that they are often unwilling to bite—the patience of all concerned being exhausted in fruitless efforts to induce them to take hold.

The expense, too, of a considerable number is by no means trifling.[185]

In addition, leeches were often difficult to obtain, and the rural physician could not easily carry them about. Leech bites could have unfortunate consequences, for many times the bleeding could not be stopped. For these and other reasons, several inventors in Europe and America sought to create a mechanical or artificial leech.[186] Such artificial leeches are often difficult to distinguish from cupping devices, because both sorts of instruments employed some form of scarification and suction. Artificial leeches however, were usually adaptable to small areas of the anatomy, and the puncture wound generally attempted to imitate a leech bite.

Perhaps the earliest instrument offered as a substitute for leeches was Sarlandière's "bdellometer," from the Greek *bdello,* "leech." Sarlandière, a French manufacturer, introduced his instrument in 1819 and, incidentally, had the prototype sent to New Orleans. The bdellometer consisted of a glass bell with two protruding tubes, one perpendicular for performing scarification, and the other oblique, for attaching the aspirating pump. A plug could be removed to allow air to enter the bell after the operation was completed, and a faucet allowed for drainage of blood without having to remove the apparatus from the body. A curved canula could be attached to the bdellometer for bleeding in the nasal passages, the mouth, the vagina, and the rectum. For internal bloodletting, the disk, with lancets, normally used for scarification, was replaced by a small brush of hog bristles.[187] Sarlandière's bdellometer attracted sufficient attention in America to be included in the numerous editions of Robley Dunglison's medical dictionary,[188] but it was ultimately no more successful than the complicated cupping devices discussed in the previous chapter.

A second French invention, also given a pretentious name, was Damoiseau's "terabdella" (meaning "large leech"), or pneumatic leech. This invention, introduced some time before 1862, met with skepticism at the outset on the part of the reviewers at the French Academy of Medicine. It consisted of two pistons attached to a plate to be placed on the floor and held down by the feet of the operator. Each piston was connected by a tube to a cup, and the whole apparatus was operated by means of a hand lever connected with both pistons. More a cupping device than an artificial leech, the terabdella met with little success beyond the French province where Damoiseau practiced.[189] (Figure 21.)

Perhaps the most successful of the mechanical leeches was known as Heurteloup's leech, after its inventor, the Frenchman, Charles Louis Heurteloup (1793–1864). Sold in most late nineteenth-century surgical catalogs for as much as $15.00, the device consisted of two parts, one a spring scarificator that made a small circular incision (about 5 mm in diameter) and the other, a suction pump, holding an ounce of blood, whose piston was raised by means of a screw. For the treatment of eye ailments, one of the major purposes for which the device was invented, it was applied to the temples.[190] A similar two-part mechanical leech was sold under the name "Luer's Leech."

One of the most interesting leech substitutes, sold by George Teimann & Co. as its "Patent Artificial Leech," employed ether in exhausting the glass "leeches." Patented by F. A. Stohlmann and A. H. Smith of New York in 1870, the "leech" consisted of a glass tube, either straight or with a mouth on the side so that the tube would hang somewhat like a living leech. To expel air from the tube, a few drops of ether were placed in it, after which it was immersed to its mouth in hot water until the ether vaporized. The tube was then applied to the skin and allowed to cool, thus sucking blood from a wound made by the scarificator, a long metal tube that was rotated to make a circular incision. One of the patentees explained the advantages of the device:

> In all previous attempts at an artificial leech the vacuum has been produced by the action of a piston. This renders the instrument too heavy to retain its position, and necessitates its constantly being held. This precludes the application of any number at once, even if the cost of half-a-dozen such instruments were left out of the account. But in the case of this leech, the tubes, being exceedingly light, attach themselves at once, remaining in position until filled; and as the cost of them is but a few cents, there is no limit to the number which may be applied.[191]

To take the place of leeches in the uterus, quite a number of uterine scarificators were sold. These were generally simple puncturing instruments without spring mechanisms. If insufficient blood flowed from the scarification, Thomas's Dry Cupper, a widely available vulcanite syringe, could be inserted into the vagina to cup the cervix before puncturing.[192] At least one attempt was made to combine puncture and suction in a device for uterine application. This was Dr. William Reese's "Uterine Leech," introduced in 1876. It consisted of a graduated glass cylinder 190 mm long and 12 mm in diameter containing a piston and a rod with a spear point. The rod was surrounded by a spring that withdrew the blade after it punctured the cervix. Several American companies, including George Tiemann & Co., offered the device for sale.[193]

Despite all the efforts to find a suitable substitute, the use of natural leeches persisted until the

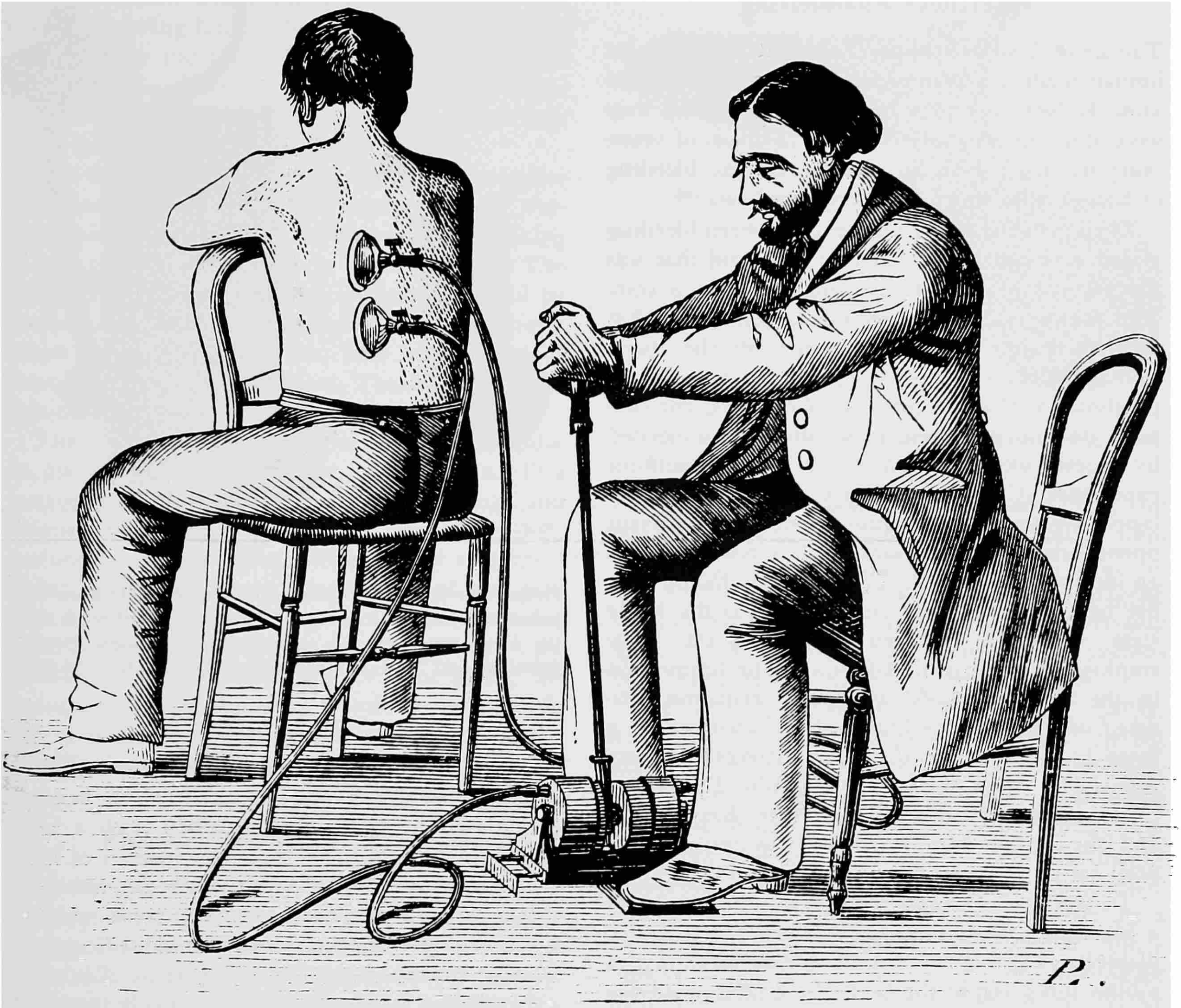

FIGURE 21.—Damoiseau's terabdella. (From Damoiseau, *La Terabdelle ou machine pneumatique*, Paris, 1862. Photo courtesy of NLM.)

practice of local bloodletting gradually disappeared in America. By the 1920s leeches were difficult to find except in pharmacies in immigrant sections of large cities like New York or Boston. One of the last ailments to be regularly treated by leeches was the common black eye. Leeches commanded rather high prices in the 1920s, if they could be found at all. One Brooklyn pharmacist, who deliberately kept an old-fashioned drugstore with the motto "No Cigars, No Candy, No Ice Cream, No Soda Water, But I Do Sell Pure Medicines," wrote in 1923:

Here in this atmosphere free from the lunch room odor my armamentarium consists of drugs and preparations from the vegetable, mineral and animal kingdoms. Among the latter are leeches, prominently displayed in a number of glass jars in different parts of the store, including one in the show window. Anything moving, anything odd, arouses the curiosity of the public, and my reputation as a "leecher" has spread far beyond the "City of Churches." Besides, this leech business is also profitable, as they are retailed at $1.00 per head without any trouble; in fact patients are only too glad to be able to obtain them.[194]

Veterinary Bloodletting

The same theories and practices that prevailed for human medicine were applied to the treatment of animals. Not only were horses routinely bled, they were also cupped and leeched.[195] Manuals of veterinary medicine gave instructions for the bleeding of horses, cows, sheep, pigs, dogs, and cats.[196]

There was one major difference between bleeding a man and bleeding a horse or cow, and that was the amount of strength required to open a vein. The considerable force needed to pierce the skin and the tunic of the blood vessel made the operation much more difficult to perform than human phlebotomy.[197] As in the case of cupping, the simplest instruments, those most often recommended by experts, were not easy to use by those without experience. Although a larger version of the thumb lancet was sometimes employed, most veterinarians opened the vein of a horse with a fleam, that is, an instrument in which the blade (commonly double beveled) was set at right angles to the blade stem. These are enlarged versions of the fleam employed in human bloodletting. The fleams sold in the eighteenth and nineteenth centuries consisted of one or more blades that folded out of a fitted brass shield. In the late nineteenth century fleams with horn shields were also sold. The largest blades were to be used to open the deeper veins and the smaller blades to open the more superficial veins.

To force the fleam into the vein, one employed a bloodstick, a stick 35–38 cm long and 2 cm in diameter. The blade was held against the vein and a blow was given to the back of the blade with the stick in such a way that the fleam penetrated but did not go through the vein. Immediately the fleam was removed and a jet of blood came forth that was caught and measured in a container. When enough blood had been collected, a needle would be placed in the vein to stop the bleeding.

Horses were most frequently bled from the jugular vein in the neck, but also from veins in the thigh, the fold at the junction of breast and forelegs, the spur, the foreleg, the palate, and the toe.

Since applying the bloodstick required a degree of skill, the Germans attempted to eliminate its use by adapting the spring lancet to veterinary medicine. The common veterinary spring lancet (which sometimes was also called a "fleam" or "phleme") was nothing but an oversized version of the brass, nob end spring lancet used on humans. Sometimes the lancet was provided with a blade guard that served to regulate the amount of blade that penetrated the skin. Although the veterinary spring lancet was quite popular in some quarters, the French preferred the simple foldout fleam as a more convenient instrument.[198] (Figure 22.)

FIGURE 22.—Knob end spring lancet used on humans compared to a knob end lancet used on horses and cattle. Note the blade guard on the veterinary spring lancet. (NMHT 302606.09 and NMHT 218383 [M-9256]: SI photo 76-7757.)

In contrast to the few attempts made to modify the human spring lancet, there were a large number of attempts to modify the veterinary spring lancets. Veterinary spring lancets can be found with a wide assortment of shapes and a wide variety of spring mechanisms. In the enlarged knob end spring lancet, pushing upon the lever release simply sent the blade forward into the skin. By a more complex mechanism, the blade could be made to return after it was injected, or the blade could be made to sweep out a curve as do the blades of the scarificator. Perhaps one of the earliest attempts to introduce a more complex internal mechanism into the veterinary spring lancets is found in John Weiss's "patent horse phlemes" of 1828. The first model invented by Weiss was constructed on the principle of the common fleam and bloodstick. As in the knob end spring lancet, the spring acted as a hammer to drive the blade forward. In a second improved "horse phleme," Weiss mounted the blade on a pivot so that the blade swept out a semicircle when the spring was released.[199]

The Smithsonian collection contains a number of different types of veterinary spring lancets. Perhaps this variety can best be illustrated by looking at the two patent models in the collection. The first is an oval-shaped lancet patented in 1849 by Joseph Ives of Bristol, Connecticut.[200] By using a wheel and axle mechanism, Ives had the blade sweep out an eccentric curve. The lancet was set by a detachable key (Figure 23).

The second patent lancet was even more singular in appearance, having the shape of a gun. This instrument, patented by Hermann Reinhold and August Schreiber of Davenport, Iowa, in 1880, featured a cocking lever that extended to form a coiled spring in the handle portion of the gun. Also attached to the cocking lever was an extended blade with rachet catches, so that by pulling on the cocking lever, the blade was brought inside the casing and the spring placed under tension. Pushing upon the trigger then shot the blade into the vein.[201] (Figure 24.)

Physical Analysis of Artifacts

The Conservation Analytical Laboratory of the Smithsonian Institution analyzed selected bloodletting instruments and one drawing from the Museum's collection. Instruments were chosen on the basis of their unique appearance and as representative examples of the major types of instruments in the collection. Six lancets and cases, two scarificators, and one pen and ink drawing were analyzed.

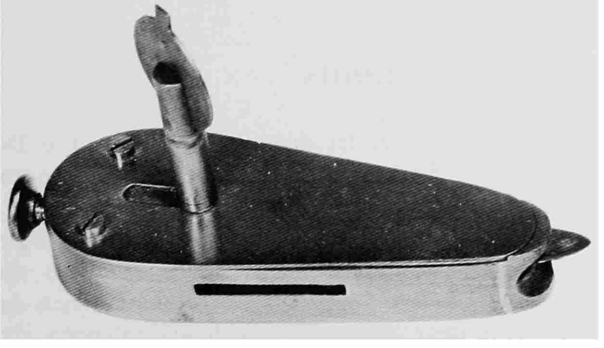

FIGURE 23.—Patent model, J. Ives, 1849. (NMHT 89797 [M-4292]: SI photo 73-4211.)

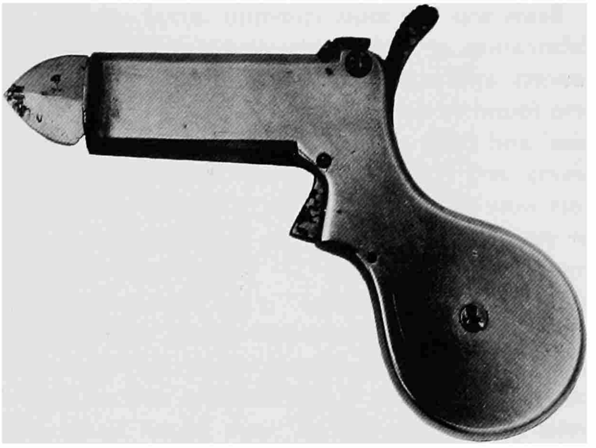

FIGURE 24.—Patent model, Reinhold and Schreiber, 1880. (NMHT 89797 [M-4327]; SI photo 73-4210.)

X-ray fluorescence analysis, response to a magnet, reaction to nitric acid, and the Vickers pyramid hardness test were among the methods of analysis used that involved no damage to the objects.

The instrument for X-ray fluorescence analysis has been modified to permit analysis of selected areas on the objects. This instrument produces, detects, and records the object's X-ray fluorescence spectrum, which is characteristic of its composition. X-rays produced by a target in the instrument strike the object and cause it, in turn, to fluoresce, or emit, X-rays. This fluorescence is detected by a silicon crystal in the detector and dispersed into a spectrum, which is displayed on an ocilloscope screen. The entire spectrum—from 0 to 40 Ke V—can be displayed or portions of it can be expanded and displayed at an apparently higher resolution that permits differentiation between closely spaced fluorescent peaks, such as those from iron and manganese. The spectrum may be transferred from the oscilloscope to a computer for calculation of the percentage of composition and for comparison with spectra of other samples. During analysis the objects can be supported and masked by sheets of plexiglas or metal foils to limit the radiation to a certain area of the object. Masks also prevent scattering of radiation off other parts of the object and off the instrument itself, which otherwise might be detected and interpreted as less concentrated components in the object.

Brass was the most common metal used in the fabrication of eighteenth- and nineteenth-century lancets and scarificators. Upon analysis the brass was found to contain 70%–75% copper, 20%–30% zinc, and other trace elements. The blades, cocking levers, and button releases of lancets and scarificators were found to be made of ferrous metal (iron or steel). In addition to the typical brass pieces, a number of "white metal" pieces were analyzed. (The term "white metal" is used to designate any undetermined silver-colored metal alloy.) Those white metal pieces dating from the eighteenth century (a Swiss or Tyrolean fleam and an English veterinary spring lancet) were found to be composed entirely of ferrous metal. The hardness of the fleam metal indicated that it was carburized sufficiently to be made of steel. Two of the spring lancets, dating from the late nineteenth century, were found to be made of a silver-copper composition that was not rich enough in silver to be sterling silver. These lancets were probably typical of the lancets advertised as silver in the late nineteenth-century trade catalogs. About 1850 an alloy imitating silver began to be widely used in the making of surgical instruments. This was German silver or nickel-silver, an alloy containing no silver at all, but rather copper, zinc, and nickel. A patent model scarificator dating from 1851 was found to contain about 63% copper, 24% zinc, and 13% nickel. This alloy is presently called "nickel-silver 65–12" alloy. The French made scarificators out of their own version of nickel-silver that was called "maillechort." The French circular scarificator was found to contain copper (55%–70%), nickel (10%–20%), zinc (20%–30%), and tin (less than 10%). The cases in which the lancets and scarificators were carried were covered with leather, despite the fact that several appeared to be covered with paper. X-ray analysis revealed that several cases contained tin, leading to the possibility that a tin salt was used in the dye-mordant for leather. The clasps on the cases were made of brass. One case was trimmed in gold leaf.

The most difficult item to analyze was the pen and ink drawing in black and red of a bloodletting man purported to be a fifteenth-century specimen (1480) from South Germany. The text is in German (Figure 25).

The watermark of the paper—a horned bull (ox) with crown—is believed to have appeared in 1310 and was used widely for two hundred years. The paper was heavily sized and no feathering of the black ink or red paint appears.

The paper fluoresced only faintly under ultraviolet light and much less brightly than new paper, leading to the conclusion that the paper is not modern. Various stains on the paper fluoresce yellow, which also indicates a considerable history for the document.

The guard strip is vellum. Red stains on this strip may have been made by blood.

The inks (brown and red) may have come from different sources or been applied at different times because of their various compositions and densities. Iron and lead were found in an area of writing on the left foot. Iron is typical of an iron gall ink. Some of the lighter lines contain graphite. The red lines contain mercury and lead suggesting a mixture of vermilion and red lead.

Analysis of the ink and paper indicates that the document has had a varied history and seems not to have been a deliberate production intended to simulate age.

Catalog of Bloodletting Instruments

Several systems of catalog numbers have been employed for instruments in the collections. The earliest instruments were originally collected by the Division of Anthropology and were given a six-digit number in the division catalog (referred to as "Anthropology"). Later objects in the collections have been given a six-digit National Museum of History and Technology (NMHT) accession number, which serves for all items obtained from one source at a given date. Before 1973, the Division of Medical Sciences used a system of numbering individual items by M numbers (e.g., "M-4151"). Since 1973, individual items have been distinguished by adding decimal numbers to the accession numbers (e.g., "308730.10"). Objects on loan have been marked as such and given a six-digit number. Other institutional abbreviations are as follows: SI = Smithsonian Institution; USNM

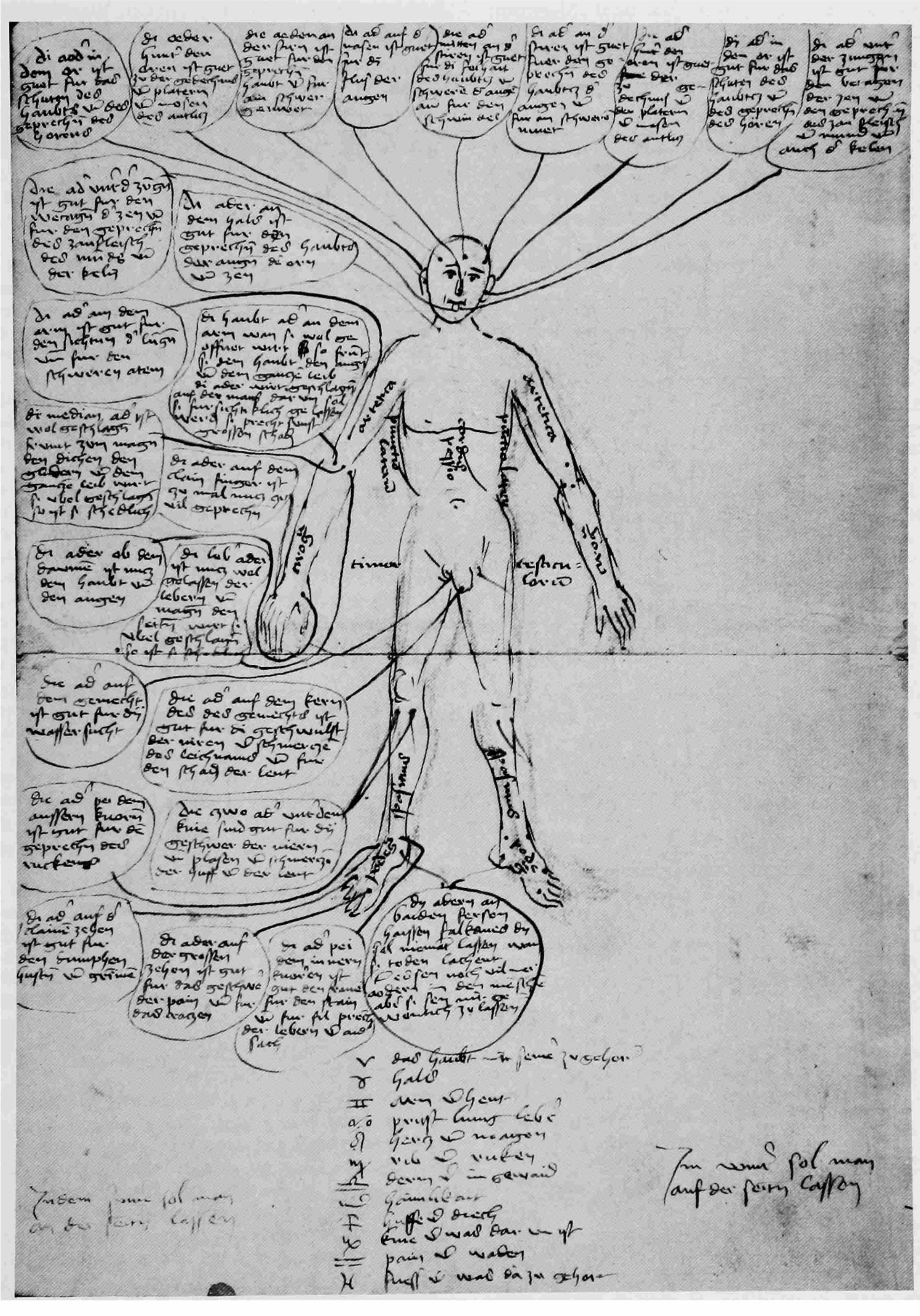

FIGURE 25.—Bloodletting manikin. (NMHT 243033 [M-10288]; SI photo 76-13536.)

= the former United States National Museum; NLM = National Library of Medicine.

Photograph numbers are labeled "BW' for black and white negative and "CS" for color slide. (Copies of photographs or slides may be purchased through the Office of Printing and Photographic Services, Smithsonian Institution, Washington, D.C. 20560.) Abbreviations for dimensions of objects are as follows: D = diameter; L = length; W = width; H = height.

Instruments within each group are arranged chronologically as accessioned by the museum.

Phlebotomy

Flint and Thumb Lancets

Flint lancets (4). Pieces of flint used to let blood by native doctors in Alaska in the 1880s. Donated by William J. Fisher late 19th century. L 22 mm, 35 mm, 43 mm, 50 mm. Anthropology vol. 30, catalog no. 127758. Neg. 73–4208 (BW, CS). (Figure 30.)

Thumb lancet, 19th century. Typical thumb lancet with steel blade and tortoise shell shield, engraved with a crown and "Evans/Old Change/London" (manufacturer). Purchased 1898. Shield: L 56 mm. Blade: L 50 mm. Anthropology vol. 30, catalog no. 143079.

Flint lancet. "Indian scarificator" collected by the Section of Ethnology of the Smithsonian 1902. L 44 mm. Anthropology vol. 30, catalog no. 143166.

Thumb lancets (4) with case, 19th century. Lancets are engraved "S. Maw" (manufacturer). The case is made of cardboard covered with brown leather and has four compartments. Used by the donor's father while a missionary in Samoa in the 1830s. Donated in 1936 by the Rev. Robert G. Harbutt. Lancets: L 55 mm. Case: L 60 mm, W 28 mm, H 10 mm. Neg. 73–4230 (BW) four lancets with case; negs. 73–4226, 73–4227, 73–4228, 73–4229 (BW & CS), individual lancets. NMHT 139980 (M–4151). (Figure 38.)

Thumb lancets (2), 19th century. Lancets are typical 19th century thumb lancets. Shell shields are broken. Second lancet is engraved with a crown denoting British manufacture. Owned by S. K. Jennings of Baltimore (1771–1854). Donated by the Medical and Chirurgical Faculty of Maryland 1976. First lancet: L 54 mm; L of blade 46 mm. Second lancet: L 58 mm; L of blade 42 mm. NMHT 302606.062.

Thumb lancets (2), 19th century. Shell shields. One shell is marked "A. L. Hernstein." Purchased 1976. First lancet: L 60 mm. Second lancet: L 70 mm. NMHT 1977.0789.

Bloodletting knife, 19th century. Handle is cylindrical and made of carved wood, which has been turned, a brass ring, and an ivory tip with a hole bored through it. Blade is double beveled and engraved "Rodgers/Cutlers to Her Majesty," which indicates that the piece is Victorian. It could have been used for many purposes, including bloodletting. Purchased 1976. L 129 mm; L of blade 30 mm. Neg. 76–76108 (BW). NHMT 321697.39.

Thumb lancets in cases (8), 19th century. Seven of the cases have silver trimming and are closed by a hinged cap. These are similar in appearance to cigarette lighters. The first case, made of tortoise shell, contains four thumb lancets (with tortoise shell sheaths). Two blades are marked "Savigny & Co.," two are marked with a cross on top of crown symbol. The second case is made of mother-of-pearl carved with an intricate floral design. It has space for four lancets but contains only one lancet marked "Thompson" on the inner side of the shell cover, and a silver pincers. The scroll initials "J H" appear on the side of the case. The third case is silver, decorated with a floral relief, and contains two lancets. The fourth case is made of shagreen and contains six lancets, three engraved "Savigny" and one "Morgan." The fifth case is made of shagreen. One blade is inscribed "STODART." Blades are rusted. The sixth case is made of shagreen. It contains one shell-covered lancet of a possible six. The blade is marked Paris. "J. P. Honard" is engraved on the silver top of the case. The seventh case is made of shagreen. It contains two lancets, one with a pearl shield and one with a shell shield. On the blade of the shell encased lancet is inscribed "B. Radford, 9 Patrick St. Conn." The last case is made of leather, which is worn. It contains one shell-encased lancet. The blade is marked "Gouldig & Ford, N.Y." Purchased 1976. Case one: L 70 mm, W 36 mm. Case two: L 69 mm, W 33 mm. Case three: L 65 mm, W 30 mm. Case four: L 74 mm, W 50 mm. Case five: L 71 mm, W 33 mm. Case six: L 75 mm, W 43 mm. Case seven: L 68 mm, W 32 mm. Case eight: L 75 mm, W 17 mm. Neg. 76–9116 (BW). NMHT 1977–0789. (Figure 5.)

Spring Lancets

Note: Lancets are measured to the tip of the casing rather than to the tip of the blade. The blade length depends upon the setting, and varies from an additional 8 to 13 mm.

Spring lancet, 19th century. Brass Knob end lancet with brass lever release. Purchased 1898. L 42 mm, W 20 mm. Anthropology vol. 30, catalog no. 143078.

Spring lancets (2) with case, 19th century. One lancet is plain with a brass lever release. Second lancet is brass with a steel lever release and has a floral design on the front and back panels. There are three settings for the height of the blade instead of the usual two. Blade is broken off. Case is square and made of wood covered with black leather and lined with rose plush. It is stamped "Braumiller, jun." Wood is broken. Leather and plush are badly torn. Donated by George B. Roth 1925. Both lancets: L 44 mm, W 20 mm. Case: L 62 mm, W 64 mm, H 20 mm. NMHT 88734 (M–2099).

Spring lancet, patent model, 1857. Lancet has a cupped end instead of the usual knob end. According to analysis by the Conservation Laboratory, the lancet is made of silver-copper alloy. A screw on the back regulates the depth of cut by moving the spring mechanism back and forth inside the outer casing. Patented by James W. W. Gordon (U.S. patent 16479). Transferred from the U.S. Patent Office 1926. L 36 mm, W 25 mm, H 6 mm. Neg. 73–10318 (BW) and 73–116 (CS), front view; 73–10319 (BW) and 73–11147 (CS), back view. NMHT 89797 (M–4298). (Figures 48, 49.)

Spring lancet, 19th century. Lancet is brass and has a brass lever release. It is engraved with the initials "A. F." Donor claimed it was a 17th-century import from Wales, but it appears to be a standard 19th century lancet. Donated by Edward Pryor 1930. L 45 mm, W 19 mm. Neg. 73–4235 (BW & CS). NMHT 112827 (M-2995). (Figure 105.)

Spring lancet, 19th century. Lancet is brass with a brass lever release. Engraved "Wiegand & Snowden/Philadelphia" (manufacturer). Donated by Dr. H. S. West 1934. L 44 mm, W 22 mm. NMHT 131386 (M–3636).

Spring lancet with case, 19th century. Standard 19th century lancet with typical case made of wood, covered with brown leather and lined with chamois. Case closes by a latch, and is stamped "Traunichtessticht," which translates, "Do not trust, it stabs." Many 19th century cases were stamped with this motto. Donated by Fred G. Orsinger 1937. Lancet: L 41 mm, W 20 mm. Case: L 71 mm, W 35 mm, H 18 mm. Neg. 73–4237 (BW & CS), without case. NMHT 145365 (M–4510).

Spring lancet blade with case, 19th century. The case is made of wood and covered with red paper, and has "F D" stamped on the bottom. A piece of paper with the date "1877" is affixed to the top of the case. This is the date that the donor received the blade from his mother, daughter of the owner, Dr. Joseph S. Dogan (1793–1870), who practiced as a country doctor in South Carolina. Donated by B. F. Arthur 1937. Blade: L 42 mm. Case: L 64 mm, W 20 mm, H 15 mm. NMHT 145290 (M–4513).

Note: In the Wellcome Museum there are two spring lancets in a case. (R 3689/1936) One of these is marked "F. D." and the other "Fischer Peter," which may indicate that this is the name of the maker of all instruments so marked. The Wellcome instruments were part of the Hamonic Collections. Dr. Hamonic listed them as 18th century instruments. Another lancet that appears to be veterinary, because of its size, is stamped "P. Fischer" (Wellcome 13516). Note that several items in this catalog are so marked.

Spring lancet with case, late 19th-early 20th century. Tiemann & Co.'s spring lancet, a modified lancet sold by George Tiemann & Co. and advertised in the Tiemann catalogs of 1879 and 1889. Lancet is made of German silver and has a domed rather than a knob end. It is stamped "Tiemann" on the back panel. Release lever is a short bar across the top. Leather case is lined in red plush and has a partition in which four extra lancet blades are contained. Lancet was one of various instruments in a medical bag used by Dr. Augustus Stabler of Brighton, Maryland, who practiced from 1889 to 1914. Donated by Sidney Snowden Stabler 1942. Lancet: L 34 mm, W 16 mm. Case: L 62 mm, W 40 mm, H 23 mm. Neg. 73–5644 (BW). NMHT 163863 (M–5141). (Figure 47.)

Spring lancet with case, 19th century. Brass lancet with brown leather case. Lancet was a part of the Squibb Ancient Pharmacy, a collection of medical and pharmaceutical objects brought by E. Squibb and Sons to the United States in 1932. On deposit from the American Pharmaceutical Association 1945. Lancet: L 40 mm, W 19 mm. Case: L 70 mm, W 38 mm, H 24 mm. NMHT 170211 (M–6385).

Spring lancets (2) with case, 19th century. Lancets are made of brass and have steel lever releases. They are engraved front and back with a floral pattern. Tip of the blade of one of the lancets is broken. Case is wood covered with red leather and is missing the top. Donated by the University of Pennsylvania 1959. First lancet: L 43 mm, W 21 mm. Second lancet: L 75 mm, W 49 mm, H 11 mm. NMHT 218383 (M–9260).

Spring lancet with case, 19th century. Brass lancet with brass lever release. Case is covered with red cloth and lined with black plush. Used by Dr. Samuel Fahnestock (1764–1836) or by his son, Dr. William Baker Fahnestock (1804–1886) of Pennsylvania. Donated by Capt. Henry Fahnestock MacComsey, U.S.N., and Dr. G. Horace Coshow 1968. Lancet: L 40 mm, W 20 mm. Case: L 74 mm, W 40 mm, H 26 mm. NMHT 280145 (M–12341).

Spring lancet with case, 19th century. Lancet has a steel lever release and is stamped "F. D." on the back panel. Other lancets have been found with these initials but so far no manufacturer has been traced. Leather of case is damaged. Owned by Dr. Harry Friedenwald of Baltimore, Maryland (b. 1864). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 40 mm, W 20 mm. Case: L 72 mm, W 34 mm, H 20 mm. NMHT 302606.008.

Spring lancet with case, 19th century. Brass spring lancet with a brass lever release. Case is stamped "Traunichtessticht" (see NMHT 145365 [M–4510]). Used by Dr. Wilbur Phelps, Baltimore, Maryland (1841–1922). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 38 mm, W 34 mm. Case: L 71 mm, W 34 mm, H 17 mm. Neg. 76–7757 (BW & CS), compares lancet to a veterinary spring lancet. NMHT 302606.009. (Figure 22.)

Spring lancet with case, 19th century. Brass spring lancet with a brass release. Case is covered with navy blue leather, lined with chamois, and stamped with a small flower and leaf design. Owned by Dr. Launcelot Jackes of Hancock, Maryland (b. late 18th century). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 40 mm, W 22 mm. Case: L 66 mm, W 34 mm, H 20 mm. NMHT 302606.039.

Spring lancet with case, 19th century. Lancet and case are very similar to NMHT 302606.039. The case is more rounded on top, is covered with black leather, and bears the same floral motif. Lancet blade is broken. Owned by Dr. George Washington Crumm of Clearspring and Jefferson, Maryland (1811–1896). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 42 mm, W 22 mm. Case: L 66 mm, W 38 mm, H 22 mm. NMHT 302606.056.

Spring lancet, 19th century. Brass lancet with steel lever release. Owned by Dr. Joseph Tate Smith of Baltimore, Maryland (1850–1930). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 42 mm, W 20 mm. NMHT 302606.057.

Spring lancets (2) with case, 19th century. Wood case, covered with brown leather and lined with brown velvet, has space for two rectangular lancets. One brass lancet, knob end, does not belong with the set. It has a steel lever release and three settings for blade height. The rectangular lancet, also made of brass, with an iron lever release and three settings for the height of the blade, is unusual in that it is triggered by a slide catch on the facing side rather than by a lever on top. The set was owned by Dr. Charles W. Owen of Maryland (1823–1857). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Rectangular lancet: L 50 mm, W 16 mm. Knob end lancet: L 42 mm, W 18 mm. Case: L 150 mm, W 34 mm, H 22 mm. NMHT 302606.058.

Spring lancet with case, 19th century. Lancet and case are similar to NMHT 302606.039. The leather of the case is torn and the lancet blade is broken. Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 42 mm, W 22 mm. Case: L 66 mm, W 38 mm, H 24 mm. NMHT 302606.061.

Spring lancet with case, 19th century. The Conservation Analytical Laboratory found the lancet to be made of a silver-copper alloy with an iron or steel lever release. It has a border around the top and along the edge and is marked "Reinhardt & C°/Balt°." Case is covered with black leather and lined in pink plush. It is decorated by a gold border and a small scroll motif. Donated by Harry L. Schrader 1972. Lancet: L 42 mm, W 21 mm. Case: L 68 mm, W 34 mm, H 20 mm. NMHT 302607 (M–14682).

Spring lancet with case, late 19th-early 20th century. Lancet is similar to the preceding lancet. It is made of white metal* (probably silver-copper) and has a border decoration along the top and around the edge. Case, which is badly rotted from water damage, is a folding style case and is closed by a clasp. There is a pocket for extra blades. Donated by John and James Draper 1973. Lancet: L 42 mm, W 21 mm. Case: L 74 mm, W 40 mm, H 18 mm. NMHT 304826.067.

Spring lancet with case, late 19th-early 20th century. Brass knob end lancet with brass lever release. Case is covered with brown leather and lined with chamois. Case is stamped "Traunichtessticht" (See NMHT 145365 [M–4510]), Owned by Dr. F. L. Orsinger of Chicago (1852–1925). Donated by Dr. William Orsinger 1973. Lancet: L 43 mm, W 22 mm. Case: L 70 mm, W 30 mm, H 20 mm. Neg. 74–4088 (BW & CS); 76–13535 (BW), interior view of spring mechanism. NMHT 308730.10. (Figures 7, 39.)

Spring lancet with case, 19th century. Brass Lancet with steel lever release. Leather of case is water damaged and is stamped "Traunichtessticht." Latch is missing. Donated by Peter H. Smith Jr., 1975 Lancet: L 50 mm, W 25 mm (w/blade extended), H 15 mm. Case: L 75 mm, W 42 mm, H 23 mm. NMHT 316508.01.

Spring lancet with case, 18th-early 19th century. Wooden case has a hand-carved space for lancet. Lancet is brass and has an unusual boot shape. The short lever release operates a catch at the very top of the lancet casing. The large blade has a guard that is regulated by a screw on the side. Purchased 1976. Lancet: L 35 mm, W 24 mm. Case: L 68 mm, W 33 mm, H 20 mm. Neg. 76–9114 (BW). NMHT 316478. (Figure 46.)

Spring lancet, late 18th-early 19th century. Unusually shaped large brass and steel spring lancet, nicely decorated and engraved with the name "M. A. Prizzi." Lancet is set by a slide cocking lever on the facing side and released by another lever. A brass plate at the top of the lancet can be moved back and forth by a screw in order to regulate the depth of cut of the lancet blade. Lancet comes with a spare blade. Purchased 1975. Lancet: L 86 mm. Neg. 76–7763 (BW, CS). NMHT 320033.06. (Figure 45.)

Spring lancet with case, 19th century. Lancet is brass with a steel lever release and has a zig-zag decoration on the front and back panels. Case is covered with brown leather and lined with chamois and has a small basket of flowers stamped on the top. Purchased 1976 Lancet: L 42 mm, W 19 mm. Case: L 71 mm, W 34 mm, H 19 mm. Neg. 73–4236 (BW & CS). NMHT 321636.01. (Figure 6.)

Spring lancet, 19th century. Lancet is engraved "F. D." on back (see NMHT 302606.008). Analysis by the Conservation Laboratory shows that the lancet is made of brass composed of 70% copper and 30% zinc plated with a tin-lead alloy. Most of the plating has been rubbed away. The blade, cocking lever, and release lever are of iron or steel. Purchased 1976. Lancet: L 43 mm, W 21 mm. NMHT 321636.02.

Spring lancet with case, 19th century. Lancet is brass and has a brass lever release. Engraved "Goulding/New York" (manufacturer). Case is made of wood, covered with black leather and lined with light brown plush. It has a tab closure. Lancet and case were not originally a set; the case was designed for a larger lancet. Donated by the American Pharmaceutical Association 1970. Lancet: L 40 mm, W 20 mm. Case: L 74 mm, W 38 mm, H 12 mm. NMHT 321641 (M–13060).

Spring lancet with case, late 19th century. Silver lancet with a button release and a border decorating the top and edge. Button release lancets were sold in the late 19th century for slightly more than lever release lancets. Analysis by the Conservation Laboratory shows that the silver is not sterling but a silver-copper alloy containing twice as much copper as sterling silver. The button release is made of ferrous metal plated with silver. The blade and cocking lever are also of ferrous metal. The case is made of wood, covered with brown leather and trimmed with gold leaf. It is closed by an ornate clasp made of ferrous metal plated with brass. Donated by the American Pharmaceutical Association 1970. Lancet: L 42 mm, W 22 mm. Case: L 73 mm, W 40 mm, H 11 mm. NMHT 321641 (M–13060.1).

Spring lancet with case, 19th century. Silver lancet with lever release described by seller as dating from 1800, although it is probably of a later date. Lancet has a border decora-

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*"White metal" is the technical term for an undetermined silver colored metal alloy. See discussion of materials at beginning of index.

tion, and the back plate is opened by a shell-design protuberance. The case is covered with brown leather with gold leaf edging, and is stamped "A. St." Case is lined with rose plush below and white silk above. Lancet is engraved "Cotzand." Purchased 1976. Lancet: L 42 mm, W 17 mm. Case: L 68 mm, W 37 mm, H 20 mm. Neg. 76–7752 (BW, CS). NMHT 321687.02. (Figure 44.)

Spring lancet with case, late 19th century. Silver lancet with a button release and a border decorating the top and the edge. Mechanism is frozen. Purchased 1976. Lancet: L 40 mm. NMHT 321697.01.

Spring lancet, late 19th century. White metal including the blade, which may have been a replacement for the original. The blade is more highly polished than the case. The black case is worn so that an indistinct mark appears on its cover. It is lined with chamois. Lancet: L 41 mm, W 17 mm, blade extends 10 mm. Case: L 65 mm, W 38 mm. NMHT 1977.0789.13.

Spring lancet with case, 19th century. Brass lancet with steel lever release. Case is covered with brown leather and lined with chamois. Leather is torn and latch is missing. Owned by Dr. Launcelot Jackes of Hancock, Maryland (b. late 18th c.). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Lancet: L 40 mm, W 20 mm. Case: L 72 mm, W 42 mm, H 24 mm. NMHT 302616.040.

Spring lancets (2) with case, late 18th-early 19th century. Pair of brass lancets in a hand-carved wooden case. First lancet has a steel lever release and is engraved with a zigzag pattern and the initials "F. D." Second lancet is shorter than usual and missing the lever release and cocking lever. Case has space cut for each lancet and an additional space for extra blades or a thumb lancet. Purchased 1976. First lancet: L 40 mm. Second lancet: L 30 mm. Case: L 84 mm, W 56 mm, H 17 mm. NMHT 321697.02.

Spring lancet, late 19th century. Brass decorated with flowers, has tulip and leaves on reverse side with iron blade and lever. Lancet: L 39 mm, W 21 mm. Case: L 65 mm, W 33 mm. NMHT 1977.0789.14.

Spring lancet, late 19th century. Brass case is unmarked. The leather case had a red lining and a top that slips off. Lancet: L 44 mm, W 18 mm. Case: L 77 mm, W 35 mm. NMHT 1977.0789.15.

Spring lancet, late 19th century. Brass case with unclear lettering "WIEGANL Phila ?owten." Leather case has red lining and closes with a hook. Lancet: L 41 mm, W 22 mm. Case: L 70 mm, W 33 mm. NMHT 1977.0789.9.

Spring lancet, late 19th century. Brass case. Leather case has a chamois lining and closed with a hook. An eagle on the cover is worn. Lancet: L 43 mm, W 19 mm. Case: L 70 mm, W 35 mm. NMHT 1977.0789.10.

Spring lancet, late 19th century. Light yellow brass case. Case is leather (worn) with a chamois lining and hook closure. Lancet: L 41 mm, W 20 mm. Case: L 71 mm, W 35 mm. NMHT 1977.0989.11.

Spring lancet, late 19th century. Brass case with small guard over blade. Cover on the back appears to be a replacement for the original. Crude wooden case is red and worn. Lancet: L 45 mm, W 33 mm. NMHT 1977.0789.12.

Spring lancet, late 19th century. Brass case with cover of the lancet missing. Leather case has a chamois lining and hook closure. Lancet: L 38 mm, W 20 mm. Case: L 70 mm, W 34 mm. NMHT 1977.0789.7.

Spring lancet, late 19th century. Lancet is of white metal including the blade. The leather case has a gold decoration around the edges. Lancet: L 41 mm, W 22 mm. Case: L 70 mm, W 36 mm. NMHT 1977.0789.8.

NOTE: For additional spring lancets, see "Cupping Sets" (NMHT 268719 [M–11878]) and "Related Artifacts" (NMHT 199536 [M–6689]) and NMHT 285125 [M–12352]).

BLEEDING BOWLS

Bleeding bowl, after 1740. Pewter bowl with horizontally projecting handle. Handle is decorated with cut out tracery, a coat of arms, and the name of the London maker, John Foster. Bowl has graduated rings every 2 ounces from 2 to 16. Held by Divison of Cultural History, Smithsonian Institution (Greenwood Collection). L 200 mm to tip of handle, D 132 mm, H 45 mm. Neg. 61166–C (BW). (Figure 4.)

Barber's basin, 18th century. Blue faience basin with green, red, and blue floral decoration. Used for shaving and probably for phlebotomy as well. Bowl is indented to fit against the neck. Purchased 1959. L 260 mm, W at indentation 173 mm, H 68 mm. Neg. 73–4220 (BW, CS). NMHT 225114 (M–9399).

Bleeding bowl. Circular bleeding bowl made of pewter and typical of the bowls used to collect and measure blood in the 18th century. Such bowls were no longer generally used in the 19th century. Bowl has a plain, flat, horizontally projecting handle and graduated circles marking every 4 ounces from 4 to 24. Purchased 1976. L 233 mm to tip of handle, D 166 mm, H 55 mm. NMHT 322691.01.

Bleeding bowl. Pewter bowl with a cut out tracery handle. Bowl has graduated markings every 2 ounces from 2 to 16. Purchased 1976. D 127 mm, H 64 mm. NMHT 322691.02.

EXTRA BLADES AND CASES

Spring lancet blades (2), 18th-19th century. Used by Dr. John Cooper, Easton, Pennsylvania, great-grandfather of the donor. Donated by the Rev. J. V. Cooper 1936. Blades: L 44 mm, W 14 mm. NMHT 139877 (M–4145).

Spring lancet case, 19th century. This case is unlike other lancet cases in the collection in that the top half is a cap which slips off. The bottom half opens lengthwise and has space for a lancet and two pockets for extra blades. Case, made of cardboard and covered with black leather, is lined in tan plush. Purchased 1963. Case: L 62 mm, W 32 mm, H 22 mm. NMHT 251481 (M–10463).

Spring lancet case, 1827. Case is handmade of wood, with fabric panels covered with glass on five sides. In the top panel, a spring lancet has been hand drawn in blue. The bottom panel contains several symbolic images and the motto, "Memento Mori." The end panel has the name of the owner, "W. M. Bonwill's/1827." The case opens by a hinge and has space carved out for two knob end lancets.

Pasted to the lid is a leather pocket containing two lancet blades of different sizes. The Smithsonian Institution also owns a matching toilet case, given by the same donor. Donated by the University of Pennyslvania 1959. Case: L 87 mm, W 48 mm, H 18 mm. Neg. 73–5847, 73–5848, 73–5849, 73–5850 (BW, various views with toilet case)/ 73–7680 to 73–7693 (CS, various views with toilet case). NMHT 218383 (M–9261).

Spring lancet case, 19th century. Two part red leather case. Inner box has space for a knob end spring lancet and two spare blades. Box slides into an outer shell with a tab closure. Owned by Dr. Robert Moore (1764–1844), who served as President of the Medical and Chirurgical Faculty of Maryland from 1820 to 1826. Donated by the Medical and Chirurgical Faculty of Maryland 1976. Case: L 78 mm, W 50 mm, H 12 mm. NMHT 302606.054.

Cupping

Scarificators

Note: Height is measured to the top of the casing. The height may vary by a few millimeters because setting the depth of cut of the blades is accomplished by raising or lowering the bottom of the scarificator.

Scarificator, 12 blades, 19th century. Octagonal brass scarificator with blades arranged on two rods which cut in opposite directions. This is a standard English-American 19th c. scarificator. As is true of all scarificators, the blades and cocking lever are made of ferrous metal (iron or steel). Two small stars on one side indicate how the top and bottom of the scarificator fit together. Purchased 1898. L 46 mm, W 42 mm, H 30 mm. Anthropology vol. 30, catalog no. 143080.

Scarificator with case, 12 blades, 19th century. Standard scarificator with blades cutting in opposite directions. Case is wood covered with red leather, lined in purple plush and closed by a latch. On top of the case is an American eagle. Donated by Dr. D. H. Welling 1925. Scarificator: L 52 mm, W 46 mm, H 36 mm. Case: L 61 mm, W 56 mm, H 77 mm. NMHT 86124 (M–2087). Note: American eagles of this type were imprinted on many objects at the time of the Centennial (1876).

Scarificator, 12 blades, patent model, 1846. Patented by George Tiemann of New York (U.S. patent 4705). Engraved "Geo. Tieman[*sic*]/No. 63 Chatham Street/New York/March 1846." The novel feature of the scarificator was the addition of an ebony handle in which a coiled spring was contained. See NMHT 254866 (M–10700), which is the same instrument as marketed by George Tiemann & Co. Transferred from the U.S. Patent Office 1926. Overall L 176 mm. Base: L 42 mm, W 42 mm, H 18 mm. Neg. 76–9115 (BW). NMHT 89797 (M–4289). (Figure 76.)

Scarificator, 13 blades, patent model, 1847. Patented by Frederick M. Leypoldt of Philadelphia (U.S. Patent 5111). Scarificator is brass, octagonal with three rods containing 4, 5, and 4 blades respectively. Blades turn in same direction. The innovation consisted of a new arrangement of the cocking lever and spring. Engraved "F. Leypoldt/Philada." Transferred from the U.S. Patent Office 1926. L 44 mm, W 44 mm, H 40 mm. Neg. 73–4213 (BW & CS). NMHT 89797 (M–4290). (Figure 77.)

Scarificator, 10 blades, patent model, 1851. Patented by Federick Leypoldt of Philadelphia (U.S. patent 8095). This is a flattened model of scarificator made of a copper-zinc-nickel alloy known as "nickel-silver," or German silver. The innovation in this patent model was a flat lever extending from the side instead of the top, which fits into slots in two racks which move back and forth and turn the pinions of the blade rods. Blades cut in opposite directions. Transferred from the U.S. Patent Office 1926. L 42 mm, W 40 mm, H 16 mm. Neg. 76–9112 (BW). NMHT 89797 (M–4293). (Figure 78.)

Scarificator, 12 blades, 19th century. Octagonal scarificator in which blades cut in the same direction. Donated by Dr. George B. Roth 1928. L 44mm, W 40 mm, H 38 mm. Neg. 76–7744 (BW, CS). NMHT 99749 (M–2336). (Figure 106.)

Scarificator, 12 blades, late 19th century. Octagonal scarificator; blades cut in opposite directions. Used by the donor's father. Donated by Aida Doyle 1932. L 48 mm, W 42 mm, H 34 mm. NMHT 118000 (M–3182).

Scarificator, 10 blades, early 19th century. Octagonal scarificator with blades cutting in the same direction. Donated by H. S. West 1934. L 46 mm, W 44 mm, H 34 mm. NMHT 131386 (M–3635).

Scarificator, 16 blades, early 19th century. This scarificator is typical of Germanic manufacture during the late 18th and early 19th centuries. It is square, hand engraved, and has has pointed blades. Blades are arranged on three rods that turn in the same direction. Engraved "J. T./Wien." Vienna was the center of early sacrificator manufacture. Sacrificator said by donor to date from 1806. Donated by the University of Pennsylvania 1959. L 35 mm, W 34 mm, H 39 mm. Neg. 73–4212 (BW, CS). NMHT 218383 (M–9257). (Figure 60.)

Scarificator, 16 blades, 19th century. Square scarificator, made somewhat later than the previous one because the blades are no longer pointed. Donated by the University of Pennsylvania 1959. L 36 mm, W 36 mm, H 32 mm. NMHT 218383 (M–9258).

Scarificator, 16 blades, late 18th-early 19th century. Square scarificator. Donated by the University of Pennsylvania 1959. L 40 mm, W 30 mm, H 32 mm. Neg. 61130-B (BW). NMHT 218383 (M–9259).

Scarificator with case, 4 blades, 19th century. Small octagonal scarificator used for cutting the temples. Bottom of scarificator is engraved with an American eagle. Case is covered with navy blue leather, lined with purple plush, and closed by a latch. Purchased 1960. Scarificator: L 28 mm, W 26 mm, H 26 mm. Case: L 42 mm, W 40 mm, H 60 mm. Neg. 76–7745 (BW, CS). NMHT 233056 (M–9639). (Figure 107.)

Scarificator, 12 blades, 19th century. This octagonal scarificator is significant in that it bears a French patent. Turning the large wing-shaped handle on the top of the instrument cocks the blades, and turning a small key on the side regulates the depth of cut of the blades. Blades cut in opposite directions. Scarificator engraved "Breveté, S.G.D. Gouv."

Purchased 1964. L 42 mm, W 38 mm, H 32 mm. NMHT 254866 (M–10695).

Scarificator with case, 12 blades, 19th century. This is the market version of Tiemann's patent scarificator (NMHT 89797 [M–4289]), with a bone handle. Engraved "Geo. Tiemann/Patent/August 20/1846." This scarificator was advertised as late as 1889. Purchased 1964. Scarificator: L 172 mm, W 45 mm, H 45 mm. Neg. 73–4237–D (CS). NMHT 254866 (M–10700).

Scarificator, 13 blades, 19th century. Octagonal scarificator with unusual number of blades arranged on three rods and cutting in the same direction. Purchased 1964. L 51 mm, W 46 mm, H 34 mm. NMHT 254866 (M–10706).

Scarificator with case, 10 blades, 19th century. Used by Mary Fueurstien Kuhn, who practiced as a midwife in Ohio and also cupped and bled people during the period 1850–1890. Scarificator was brought to the United States from Germany by Mrs. Kuhn's father, who was a doctor. Blades cut in opposite directions. Case is covered in brown leather and lined in rose plush. Donated by Mrs. Arthur Peterman 1964. Scarificator: L 45 mm, W 42 mm, H 32 mm. Case: L 58 mm, W 55 mm, H 71 mm. NMHT 255254 (M–10892).

Scarificator, 16 blades, late 18th-early 19th century. Square scarificator. Top cap has a scalloped edge. Blades appear to be pointed. Mechanism is frozen. Donated by Harry L. Schrader 1972. L 34 mm, W 34 mm, H 34 mm. NMHT 302607 (H–14681).

Scarificator, 16 blades, late 18th-early 19th century. Square scarificator. Mechanism is frozen. Donated by John and James Draper 1973. L 38 mm, W 35 mm, H 32 mm. NMHT 304826.066.

Scarificator with case, 12 blades, late 19th-early 20th century. Octagonal scarificator with blades cutting in opposite directions. Two stars are engraved on the top and the bottom of one side. Case is cardboard covered with leather. Owned by Dr. F. L. Orsinger of Chicago (1852–1925). Donated by Dr. William Orsinger 1973. Scarificator L 45 mm, W 40 mm, H 35 mm. Case L 54 mm, W 48 mm, H 80 mm. Neg 74–4089 (BW, CS). NMHT 308730.11.

Scarificator with case, 12 blades, 19th century. Octagonal scarificator with blades cutting in the same direction. There are two star markings on the top and the bottom of one side. Case is made of cardboard covered with black leather. Donated by Ada and Grace Abrahamson 1975. Scarificator: L 43 mm, W 40 mm, H 34 mm. Case: L 56 mm, W 47 mm, H 73 mm. NMHT 318916.01.

Scarificator, 13 blades, 1973. Unusual hand-made brass and iron scarificator, engraved with decoration and the name "Domenico Pica" and date "1793." Blades are set on three rods of four, five, and four blades (see NMHT 254866 [M–10706]). The scarificator is octagonal but much taller than the standard octagonal model. Unlike all other scarificators in the collection, the bottom opens by a hinge, and a key on top raises and lowers the interior mechanism so as to regulate the depth of cut. Blades are cocked by a lever on top and released by a button on the side. Purchased 1975. L 50 mm, W 42 mm, H 60 mm. Neg. 76–7742 and 76–7743 (BW, CS). NMHT 320033.01. (Figure 66.)

NOTE: The earliest marked scarificator known to the authors is one in the Wellcome Medical Collection (Wellcome number R 2.852/1930 C.H.M.), inscribed 1747. The case and blade are made entirely of iron or steel. L 144 mm, W 45 mm. Another one with a brass case (Wellcome number 290 or 6 7/36, in the Hamonic Collection) is inscribed Johann Darmreuther in Vendelstein 1769. A third one with a brass case and thirteen blades (Wellcome number 13555) is marked "Jo. Bat. Boeller *Fece anno* 1762."

Scarificator, 16 blades, late 18th-early 19th century. Square scarificator with 16 pointed blades engraved, in script, "Joseph Plunger in Brünn." Case is covered with brown leather. Purchased 1975. L 32 mm, W 32 mm, H 30 mm. NMHT 320033.02.

Scarificator, 12 blades, 19th century. Standard octagonal scarificator with blades cutting in opposite directions. Stamped on the bottom with an American eagle, similar to that of NMHT 233056 (M–9639). This may mean the scarificators were made around the time of the Centennial. Purchased 1975. L 48 mm, W 45 mm, H 28 mm. NMHT 320033.03.

Scarificator, 12 blades, 19th century. Standard octagonal scarificator with blades cutting in opposite directions. Engraved "H & H Hilliard/Edinburgh." Purchased 1975. L 54 mm, W 47 mm, H 35 mm. NMHT 320033.04.

Scarificator, 16 blades, mid-late 19th century. Circular scarificator with fluted sides of the type manufactured by Maison Charrière in Paris. Seller describes instrument as French, mid-19th century. Analysis by the Conservation Laboratory shows that the instrument was made of an alloy of copper, zinc, nickel, and tin—probably the alloy that the French called "maillechort." Winged lever on top triggers the sixteen small blades arranged on two rods and cutting in opposite directions. A round knob on the side is pushed downward to release the blades. Presumably by turning the bottom, one can regulate the depth of cut. However, the bottom is frozen. Purchased 1975. H 31 mm, D 45 mm. Neg. 76–7746. NMHT 320033.05. (Figure 74.)

Scarificator, 12 blades, 19th century. Standard octagonal scarificator with blades cutting in opposite directions. Used by Dr. G.W.M. Honberger (b. 1819). Donated by the Medical and Chirurgical Faculty of Maryland 1976. L 46 mm, W 44 mm, H 32 mm. NMHT 302606.006.

Scarificator with case, 12 blades, 19th-20th century. Standard octagonal scarificator. Mechanism is frozen. Case covered with brown leather and lined with brown plush. Used by Dr. Jesse O. Purvis (b. 1880). Donated by the Medical and Chirurgical Faculty of Maryland 1976. Scarificator: L 48 mm, W 46 mm, H 32 mm. Case: L 61 mm, W 54 mm, H 79 mm. NMHT 302606.059.

Scarificator, 10 blades, late 19th century. Standard scarificator, blades cutting in opposite directions, owned by Dr. Charles Carroll Shippen of Baltimore (b. 1856). Donated by the Medical and Chirurgical Faculty of Maryland 1976. L 48 mm, W 44 mm, H 34 mm. NMHT 302606.060.

Scarificator, 12 blades, 19th century. Donated by the Medical and Chirurgical Faculty of Maryland 1976. L 48 mm, W 44 mm, H 36 mm. NMHT 302606.217.

Scarificator, 10 blades, 19th century. Octagonal scarificator of white metal with an iron lever. Purchased 1976. L 41 mm, W 39 mm, H 31 mm. NMHT 1977.0789.40.

Scarificator, 16 blades, 19th century. Purchased 1976. L 41 mm, W 35 mm, H 32 mm. NMHT 1977.0789.41.

NOTE: Additional scarificators are found under "Cupping Sets" and in the "Barber-surgeon's kit" listed under "Related Artifacts."

CUPS

Cupping cup, glass, 19th century. Large dome-shaped cup. Purchased 1898. H 82 mm, D 66 mm. Anthropology vol. 30, catalog no. 143081.

Cupping cup, glass, 18th-19th century. Hand-blown bellied cup from Hebron, Palestine. Donated by Dr. Cyrus Adler 1902. H 53 mm, diameter 31 mm. Anthropology vol. 30, catalog no. 143155. Neg. 59139–A (BW).

Cupping cup, 12th century. Cup is made of opaque greenish glass and is triangular in shape. A vacuum is created in the cup by sucking air from the cup through a tubular extension on the side. This 12th century cup was recovered in Nishapur, Persia, by Dr. Richard Ettinghausen. On loan from Dr. Ettinghausen 1955. H 68 mm, D 42 mm. Neg. 73–4205 (BW, CS). NMHT 207389 (M–6836). (Figure 108.)

Cupping cups (2), Pewter, 18th century. These cups are similar to those found in a Revolutionary War surgeon's kit held by the Smithsonian, and may therefore be of military issue. Metal cups were often preferred to glass for military purposes because they were unbreakable. Donated by Hattie Brunner 1955. M–6829 H 42 mm, D 34 mm. M–6830 H 38 mm, D 34 mm. Neg. 76–9109 (BW), includes German brass cup. NMHT 207399 (M–6829 and M–6830).

Cupping cup, 12th century. A second Persian spouted cup (cf. NMHT 207389 [M–6836]), also made of opaque greenish glass, but more dome shaped. Purchased 1959. H 52 mm, D 50 mm. Neg. 73–4215 (BW). NMHT 224478 (M–8037).

Cupping cups (3), glass, 18th-19th centuries. Cups of smaller diameter such as these were used for cupping on the temples and other parts of the body with limited surface area. Cups are molded and slightly bellied. Purchased 1964. First cup: H 54 mm, D 36 mm. Second and third cups: H 56 mm, D 36 mm. NMHT 254866 (M–10694).

Cupping cup, horn, 20th century. A horn of a cow from Madaoua, Niger Republic, West Africa, used for drawing blood as late as the 1960s. There is a small foramen at the tip for exhausting the air by sucking. Purchased 1966. L 88 mm, D 52 mm. Neg. 73–5643 (BW, CS). NMHT 270023.01 (M–11998). (Figure 37.)

Cupping cups, glass, 19th century. Set of five dome-shaped cups ranging from 50 mm to 60 mm in diameter and 64 mm to 72 mm in height. They were dated by the seller as 1895. Purchased 1969. NMHT 287162 (M–12872).

Cupping cups (2), glass, 20th century. These two small cups were purchased about 1912 by Mr. Harry Zucker from a drug supply company on 2nd Street and Avenue B on the Lower East Side of New York City. Mr. Zucker used the cups for dry cupping only. Donated by Ruth Zucker 1972. H 54 mm, D 34 mm. NMHT 302834.1 and 302834.2.

Cupping vessels (5), glass, 19th-20th centuries. Set of five dome-shaped cups ranging from 52 mm to 56 mm in height and 44 mm to 48 mm in diameter. Owned by Dr. E. L. Orsinger of Chicago (1852–1925). Donated by Dr. William Orsinger 1973. Neg. 74–4087 (BW, CS). NMHT 308730.09.

Cupping vessels (3), glass, 18th-19th centuries. These three cups have button like protuberances on top for ease in handling. Cups were often pictured in 18th century surgical texts with such protuberances. In the 19th century most cups lacked them. Purchased 1976. NMHT 314016 .236–.239. (Figure 109.)

Cupping vessel, glass, 19th century. Slightly bellied, hand-blown cup. Donated by Ada and Grace Abrahamson 1975. H 47 mm, D 43 mm. NMHT 318916.02.

Cupping vessel and bloodletting knife, 17th century. Persian brass conical cupping cup with a small hole at the tip for mouth suction. Knife has a wood and brass handle and a folding blade. Seller gives date as 17th century. Purchased 1976. Knife L 110 mm (folded). Cup L 86 mm, D 46 mm. Neg. 76–7749 (BW, CS). NMHT 320033.07. (Figure 110.)

Cupping vessel, brass, 18th century. German brass cupping vessel. Purchased 1976. H 30 mm, D 35 mm. Neg. 76–9109 (BW), includes two pewter cups. NMHT 321697.22. (Figure 111.)

Cupping vessels, glass, 19th century. Five small, hand-blown, green glass cupping cups. All are approximately the same size. Purchased 1976. Average dimensions: H 44 mm, D 35 mm. NMHT 321697.23–.27.

Cupping vessels, glass, 19th and 20th centuries. Assortment of 22 cupping cups, either dome-shaped or slightly bellied. Various sizes. Purchased 1976. NMHT 321697.28–.49.

CUPPING SETS

Cupping set, 19th-20th century. Set consists of three cupping glasses, two dome-shaped and one bellied (M–4766, M–4767, M–4768), a 16 blade square scarificator (M–4771), a candle in a metal holder used to ignite the alcohol (M–4769), and a bit of sponge in a wire holder (M–4770). Presumably, the sponge would be dipped in alcohol, ignited, and inserted into the glasses. Used by Dr. Fred L. Orsinger of Chicago in the early 20th c. Donated by Fred G. Orsinger 1939. Scarificator: L 46 mm, W 37 mm, H 33 mm. Sponge and holder: L 78 mm. Neg. 61135–C (cupping glasses); 61130–B and 61130–C (scarificator), front and back views; 61164–B (candle in metal holder); 61129–D (sponge with wire holder); 76–9111 and 76–9113, internal views of scarificator. All negatives BW. NMHT 152130 (M–4766–71). (Figures 13, 43, 62.)

Cupping set, 19th century. Contained in a mahogany case with red velvet lining are two glass cups without valves, a square model 16 blade scarificator with a leather case top, a braided leather tourniquet, a standard brass spring lancet in a case with an American eagle stamped in gold, and two lancets used on the gums with tortoiseshell shields. One gum lancet is engraved "Kuemerle & Kolbe," a Philadelphia manufacturer. Case was originally intended for a set of six brass valved cupping glasses and a pump. Owned and used by Dr. Elam Dowden Talbot of Barlow County, Virginia (1810–1881). Donated by Elam D. Talbot through Edna G. Dorr 1966. Case: L 204 mm, W 140 mm, H 110 mm. NMHT 268719 (M-11878).

Cupping set, late 19th century. Set of four cupping glasses with brass fixtures, a pump, and two octagonal scarificators. Three of the cups are identical in size, and the fourth is slightly larger. One scarificator has 13 blades arranged on three rods turning in the same direction (cf. NMHT 254866 [M-10706]). Scarificator is engraved "Schively/Philad." (manufacturer). The other scarificator has 10 blades turning in opposite directions. Used by Dr. Robert Evans Bromwell, Port Deposit, Maryland, in the late 19th century. Donated by Dr. Bromwell's daughter, Roberta Bromwell Craig, 1970. Case: L 203 mm, W 135 mm, H 110 mm. NMHT 290051 (M-13113).

Cupping set, 19th century. Mahogany case lined in rose plush has six compartments holding 5 valved cups of slightly varying shapes. One cup and pump are missing. Used by Dr. Launcelot Jackes, a member of the Medical and Chirurgical Faculty of Maryland. Donated by the Medical and Chirurgical Faculty of Maryland 1976. Case L 184 mm, W 143 mm, M 94 mm. NMHT 302606.005.

Cupping set, 19th century. This elegant set was manufactured by Charrière of Paris. Set includes a circular scarificator with fluted sides similar to NMHT 320033.05 but made of brass. Scarificator is engraved "Breveté S.G.D. Gouv." Also in the set are a brass pump, tubing, and three distinctive mushroom shaped glasses provided with stopcocks. Case is made of wood and lined with fabric. All pieces except tubing and scarificator are engraved with the Charrière name. Set was said to have been purchased in Paris in 1850 by Dr. Asa Shinn Linthicum. Donated by the Medical and Chirurgical Faculty of Maryland 1976. Case: L 240 mm, W 150 mm, H 94 mm. First glass: H 110 mm, D 74 mm. Second glass: H 130 mm, D. 80 mm. Third glass: H 94 mm, diameter 54 mm. Pump: L 160 mm, D 26 mm. Scarificator: H 32 mm, D 46 mm. Tube: L 450 mm. Neg. 75-090 (BW & CS), 75-4237-C (CS). NMHT 302606.007. (Figure 70.)

Cupping set, 19th century. Mahogany case lined in purple plush has compartments for eight cups and space for a pump. Seven cups with valves remain, one of them a narrow necked fluted cup for cupping the breasts. Found in the case, though not part of the set, are an envelope with a lancet blade and a packet of six lancet blades, each of slightly different shape. On the packet is handwritten "American/25 each." Donated by the Medical and Chirurgical Faculty of Maryland 1976. Case: L 249 mm, W 130 mm, H 100 mm. NMHT 302606.035.

Cupping set, mid-19th century. Charrière cupping set with four mushroom-shaped glass cups (the largest two with round edges and the smaller two with oval edges) with brass stopcocks, a pump, and a scarificator. Two of the cups and the scarificator are engraved with the Charrière name. The scarificator is octagonal and has twelve small blades cutting in opposite directions. Internally it has two rolled springs as described in the Charrière patent of 1841. Brass wrench case is mahogany and lined with a reddish chamois above. Pasted to the chamois is a bit of leather with wording in gold which reads "Paris/Charrière/Frabricant/Des/Hopitaux/Civils/et/Mil. Rue de l'École de Méd. No. 7 (Bis)." Purchased 1976. Scarificator: L 42 mm, W 40 mm, H 34 mm. Pump: L 180.8 mm. Wrench: L 76.2 mm. Case: L 250 mm, W 133 mm, H 105 mm. Neg. 76-9117 (BW); 76-9110 (BW), scarificator showing springs. NMHT 1977.0789.44.

Cupping set, 19th century. Set may date from early to mid 19th century. Wooden case, lined with brown velvet, contains two glass cups, two scarificators, a ball handled torch stuffed with a cotton wick, and a cut glass alcohol bottle. Large scarificator has eight blades, almost pointed in shape and cutting in opposite directions. Smaller scarificator has four blades on one rod. Both scarificators are engraved, in script, "H. Johnson/31 King Street/Borough." On top of the case is a silver plate with the name of the owner, "Mr. Sam Richards." Purchased 1976. Torch: L 111 mm. Bottle: H 65 mm. Large scarificator: L 54 mm, W 48 mm, H 37 mm. Small scarificator: L 36 mm, W 35 mm, H 29 mm. Case: L 248 mm, W 109 mm, H 94 mm. Neg. 76-9119 (BW). NMHT 1977.0789.48. (Figure 68.)

Cupping set, 19th century. This unique set consists of a red leather case lined in purple velvet, four cups with brass fittings, a large octagonal scarificator, and a pump. The most interesting piece in the set is the pump, an oval cylinder enameled in yellow with a gold and black floral design on front and back. On top of the cylinder are both the brass pump and the attachment to the cups. The scarificator has twelve blades cutting in opposite directions and is engraved, in script, "J & W Wood/74 King Street/Manchester." The four cups vary widely in size, the largest having a diameter of 73 mm, the smallest a diameter of 43 mm. Purchased 1976. Pump: H 170 mm, L 78 mm, W 56 mm. Case: L 300 mm, W 150 mm, H 113 mm. Neg. 76-9118 (BW). NMHT 1977.0789.47.

Cupping set, 19th century. Case is mahogany with two ivory keyholes and a brass handle. It is lined in red plush. Set includes nine glass cups of various sizes (including an oval cup), each with screw threads covered by a brass cap. Pump is brass, 142 mm long, and has a bit of leather wrapped around the outside of the screw threads. There is an extra compartment in the case that might have held a tenth cup, but now contains only the key. In a compartment lined with silver paper and covered by a red plush top with ivory handle are two octagonal scarificators. The first is a common twelve blade scarificator in which the blades cut in opposite directions. It is engraved with a crown and "Evans/London." The second is unusual in that it has eleven blades arranged on two rods. It is also engraved "Evans/London," and on top is engraved, in script, "W Tothill," and in block letters, "Staines No 2." The mechanism is frozen. Purchased 1976. Case: L 285 mm, W 210 mm, H 106 mm. Neg. 76-7747 (BW, CS), pieces in case; 76-7748 (BW, CS), pieces out of case. NMHT 321697.21. (Figure 112.)

Cupping set, 19th century. Case is mahogany, lined in red velvet, with brass bindings on the corners and is incomplete. A brass plate on the cover is blank. The key is missing. Set includes two glass cups without fittings, two brass stopcocks, one 12–blade scarificator, and a brass holder for a wick, which is missing. The scarificator bears the inscription on one side, "Salt & Son/Birmingham." Purchased 1976. Brass wick holder: L 101.6 mm. Cups: D 53.8 mm and 52.3 mm. Case: L 223 mm, W 127 mm, H 103 mm. NMHT 1977.0789.45.

Cupping set, 19th century. Case is mahogany with brass "straps" and a brass handle that rests flush with the lid on the case. The key is missing. Set contains two glass cups, one alcohol lamp, and one octagonal bladed scarificator. One cup is shaped like the early bronze cups. Purchased 1976. Alcohol lamp: L 67 mm, D of base 45 mm, D of top 20 mm. First Cup: L 90 mm, D at opening 50 mm. Second cup: L 63 mm, D of base 45 mm. Case: L 260 mm, W 105 mm, H 98 mm. NMHT 1977.0789.46.

Cupping set, 19th century. Case is red leather and closes with two brass hooks. It contains two glass cups with fittings, a brass syringe, a small glass bottle shaped like a test tube, and a brass three-point scarifier with a spring setting and a button release. The set is unusual for its small size. Purchased 1976. Case: L 154 mm, W 108 mm, H 42 mm. Syringe: L (closed) 101 mm, D 25 mm. Cups: L 60 mm and 67 mm, D 28 mm and 23 mm. Scarificator: L 52 mm, D 20 mm. NMHT 1977.0789.49.

Cupping Apparatus

Cupping apparatus with case, patent model, 1844. Cupping set patented by Dr. R. J. Dodd, Surgeon, U.S.N. (U.S. patent 3537). Brass syringe with ivory handle is stamped "Dr. Dodd's Improved Cupping Apparatus." Syringe can be fitted with either a large or small plate with blades. To operate an internal part, a straight or curved glass tube is attached to the syringe along with a flexible metal lancet that runs the length of the tube. Straight glass tube is broken in two parts. Case is mahogany and lined with red velvet. On hinge is stamped "Horne Patent." Transferred from the U.S. Patent Office 1926. Case: L 307 mm, W 178 mm, H 80 mm. Neg. 73–4237B (CS). NMHT 89797 (M–4288).

Cupping apparatus, patent model, 1856. Patented by Mr. Loyall Tillotson of Thompson, Ohio (U.S. patent 15626). Model of plunger apparatus is made of wood, though the actual instrument would have been made of metal. The body of the instrument was to be attached to a cup (not included in the model) with a spiral wire to which a battery would be attached. The novelty of the apparatus was that electricity would be employed in conjunction with dry cupping. Transferred from the U.S. Patent Office 1926. H 160 mm, D 60 mm. NMHT 89797 (M–4296).

Cupping apparatus, patent model, 1867. Patented by Mr. William D. Hooper of Liberty, Virginia (U.S. patent 68985). Model consists of a brass syringe attached to a wooden cup. In the working instrument the cup would be made of glass. Model does not contain the diaphragm and cutting blades. The novelty was that blades were to be tubular with adjustable length and that they would remain in the skin while blood was being removed. Transferred from the U.S. Patent Office 1926. Overall L 202 mm. Cup: L 47 mm, D 36 mm. Neg. 73–4214 (BW, CS). NMHT 89797 (M–4309).

Cupping apparatus with case, late 19th century. Invented by the Drs. W. S. Black and F. Black and manufactured by Wm. B. Stewart, Trenton, New Jersey, this set includes a hard rubber pump, three glass cups, the smallest for cupping the breasts, a valve, and a head for the pump. Missing are a nipple shield and rubber tubing. Case is made of wood and has a label attached to the inside top with an illustration of the set, the title, "Drs. W. S. & F. Black's Combined Cupping Apparatus, Breast Pump, Stomach Pump, Aspirator, Atomizer, Etc., Etc.," the name of the manufacturer, and directions for use. Donated by the Medical and Chirurgical Faculty of Maryland 1976. Case: L 250 mm, W 120 mm, H 78 mm. NMHT 302606.-036.

Cupping apparatus with case, late 19th century. Another example of the previous all-purpose cupping set with the same pieces and three fragments of rubber tubing. Donated by the Medical and Chirurgical Faculty of Maryland 1976. NMHT 302606.037.

Breast Pumps

Breast pump, patent model, 1879. Patented by William Kennish of Philadelphia (U.S. patent 219738), this breast pump consists of a glass receiver with a hanging glass globe to catch the milk, and a rubber bulb to provide suction. The innovation was the addition of an internal valve and a valve at the bottom of the globe in such a way that continued compression and expansion of the large rubber bulb would cause milk to flow out of the valve at the base of the globe. Transferred from the U.S. Patent Office 1926. L 141 mm. NMHT (M–4343).

Breast pump. Glass breast cup with brass fittings and brass pump in a wooden case lined with green felt. Donated by the College of Physicians, Philadelphia, 1958. Cup: L 99 mm, W 72 mm at widest point. Pump: L 88 mm. Case: L 132 mm, W 121 mm, H 82 mm. Neg. 76–7761 (BW, CS). NMHT 220170 (M–7435). (Figure 113.)

Breast pump. Glass breast pump with tube for self-suction of the breasts. Tip is broken. Purchased from the Medizinhistorisches Institut, Universität, Zurich, 1960. L 305 mm, H 80 mm. NMHT 232067 (M–9578).

Breast pump. Glass breast cup with protuberance for holding milk, attached to a rubber bulb. Top of bulb is stamped "Union India Rubber Co/Goodyear's Patent/New York/1844 & 48." Part of the original cardboard carton is extant. Donated by Mr. and Mrs. Elliston P. Morris 1964. L 205 mm, W of bulb 87 mm. Neg. 76–7762 (BW, CS). NMHT 252497 (M–10510). (Figure 84.)

Breast pump. Hand blown breast pump with glass tube for self-suction. Purchased 1965. L 233 mm, W 103 mm at widest point, D 70 mm. Neg. 76–7759 (BW, CS); 76–7760 (BW, CS). NMHT 260557 (M–11467). (Figure 83.)

Breast pump, 19th century. Glass breast cup with protuberance for holding milk attached to a vulcanite pump. Purchased 1965. L 242 mm. NMHT 260557 (M-11467.1).

Breast pump. Glass cup with "white metal" syringe similar to Meig's Piston Breast Pump that was sold through surgical and pharmaceutical catalogs towards the end of the 19th century. Handle is missing. Donated by George Watson 1968. L 200 mm. NMHT 281244 (M-12343).

Breast pump. Another example similar to the one above. Used by Dr. Robert E. Bromwell, Port Deposit, Maryland d. 1906). Donated by Roberta Craig 1972. L 168 mm, D of bulb 79 mm, D 35 mm. NMHT 299502 (M-14703).

Leeching

Leeches. Two leeches (Hirudo medicinalis) purchased in 1898, preserved and later mounted in plastic. L of leeches 83 mm. Anthropology vol. 30, catalog no. 143077. Neg. 73-4233 (BW, CS). (Figure 91.)

Leech jar, 19th century. White ceramic leech jar typical of jars found in late 19th century pharmacies. Word "leeches" is painted in black with the symbol of medicine below in gold. Top is missing. On loan from Dr. Frederick D. Lascoff 1954. H 242 mm, D 229 mm. Neg. 73-4232 (BW, CS). NMHT 201821 (M-6712). (Figure 114.)

Leech jars, 19th century. Elegant pair of tall Staffordshire leech jars. They are light blue, ornamented with gold bordered leaves in relief, and marked "Leeches" in gold on a dark blue decorated panel. Covers are perforated and have flower-shaped finials. Donated by Smith, Kline, and French Laboratories 1965. H 460 mm, D at widest point 215 mm. Neg. 73-4231 (BW, CS). NMHT 263554 (M-11504). (Figure 20.)

Leech jar, 19th century. In contrast to the other jars in the Smithsonian collection, this one is small and plain, and perhaps more typical of 19th century leech jars. It is a white ceramic jar shaped like a canister with two knob handles and a perforated lid with its own knob handle. Jar is labeled "Leeches" in black and stamped "Germany" and "IQ" below. Purchased 1976. It was formerly owned by Dr. Sydney N. Blumberg. H 175 mm, D 107 mm. NMHT 1977.0789.43.

Leech jars, 19th century. Pair of tall Staffordshire leech jars with royal blue handles and royal blue perforated canopy tops. The jars are decorated with a multi-colored floral design upon a magenta background. Purchased 1976. H 710 mm, W 265 mm. Neg. 76-7765 (BW, CS). NMHT 321697.18-19. (Figure 115.)

Lithograph, 1814. Framed colored lithograph dated "London/ 1814" and titled "Leech Finders." Picture shows three women gathering leeches by a stream. Purchased 1975. W 454 mm, H 363 mm. Neg. 76-7741 (BW, CS). NMHT 320033.08. (Figure 85.)

Artificial leech, 19th century. Brass, cylindical "scarificator" has three pointed blades arranged in a triangle so as to simulate a leech bite. Blades are cocked by pulling on the handle of the device, and released by pushing a small button on the cylinder. Set also includes two small oval glass cups with brass stopcocks and a brass pump, a glass tube with cork lid for collecting blood, and a mass of silvery thread. The use of the thread is uncertain. Case is made of wood covered with red leather and lined with black plush. Unfortunately there are no manufacturer markings or other clues to the provenance of this unusual set. Purchased 1976. "Leech:" L 61 mm, D 20 mm. Pump: L 102 mm. Case: L 155 mm, W 107 mm, H 45 mm. Neg. 76-9120 (BW). NMHT 316478. (Figure 98.)

Leech cage, 19th century. Tin, nickel, lead composition. The surface is worn and five holes are punctured in the hinge at one end. Purchased 1976. L 120 mm, H 32 mm, W 31 mm. Neg. 77-13984 (BW, CS). NMHT 1977.0576.02. (Figure 116.)

Veterinary Bloodletting

Fleams

Note: Widths are measured at the widest point.

Fleam, 18th-19th century. Fleam has a brass shield and three fold out blades of different sizes. Donated by M. Lamar Jackson 1932. L 80 mm, W 27 mm. Neg. 73-4206 (BW, CS). NMHT 121573 (M-3462). (Figure 100.)

Fleam, 19th century. Fleam has a brass shield, one blade, and a tenaculum (hook). Shield is engraved "Proctor" (manufacturer). Donated by Joseph L. Clough 1947. L 84 mm, W 27 mm. Neg 73-4209 (BW). NMHT 176124 (M-6480).

Fleam, 19th century. Fleam has a brass shield, three blades, and a knife. Donated by the University of Pennsylvania 1959. L 81 mm, W 25 mm. Neg. 61125-A (BW). NMHT 218383 (M-9255). (Figure 117.)

Fleam, 19th century. Fleam has a brass shield and three blades, each marked with a crown denoting British manufacture and a "W." Said to have been made in Sheffield, England. Purchased 1960. L 97 mm, W 33 mm. Neg. 59139-H (BW), case open, blades displayed; 59139-G (BW), case closed. NMHT 233570 (M-9665). (Figure 118.)

Fleam, 17th or 18th century. Hand-made curved bar with projecting blade, described by seller as Swiss or Tyrolean. Case is wooden and hand-carved. It is not clear whether this fleam was used for human or for animal bloodletting. Purchased 1960. Fleam: L 129 mm. Case: L 146 mm, W 47 mm at widest point. Neg. 59139-E (BW). NMHT 233570 (M-9666). (Figure 42.)

Note: There are two interesting early fleams in the Medical Historical Collection of Zurich University. One has a plain wooden handle and one has a turned metal handle with a metal extension.

Fleam, 19th century. Fleam has a horn shield and three blades. The first blade is stamped "Borwick," an English manufacturer. Purchased 1964. L 82 mm, W 28 mm. NMHT 254866 (M-10696).

Fleam, 19th century. Fleam has a brass shield and two blades. First blade is stamped "Harmer & Co's/Cast Steel Fleams/ Sheffield." Donated by H. J. Hopp 1970. L 82 mm, W 27 mm. NMHT 291361 (M-13828).

Fleam, 19th century. Fleam has brass shield and three blades. First blade is stamped "W. Harmar & Co. Cast Steel fleams Sheffield." Purchased 1976. L 80 mm, W 27 mm. NMHT 321697.24.

Fleam, 18th century. Five-bladed fleam said to have been made in Denmark. Instrument appears to be hand-made. Brass shield has a hinged piece covering the blades that is held closed by a brass latch. Purchased 1976. L 89 mm, W 30 mm, H 17 mm. NMHT 321697.16.

Fleam with case, 19th century. Fleam has a brass shield and three blades, engraved with a "W" over the name "Pepys." Fitted leather case. Purchased 1976. Fleam: L 102 mm, W 40 mm. NMHT 321697.03.

Fleam with case, 19th century. Fleam has a brass shield, two blades, and a knife. Fitted leather case. Purchased 1976. L 94 mm, W 26 mm. NMHT 321697.04.

Fleam with case, 19th century. Fleam has a horn shield, two blades, and is engraved "Green & Pickslay." Fitted black leather case. Purchased 1976. L 100 mm, W 32 mm. Neg. 76–7758 (BW, CS). NMHT 321697.05. (Figure 101.)

Fleam with case, 19th century. Fleam has a brass shield and four blades. Fitted leather case. Owner's name, "C. Famell Isleworth[?]," is written in ink on the case. Purchased 1976. L 79 mm, W 27 mm. NMHT 321697.06.

Fleam, 19th century. Brass shield, four blades, and one hook. Purchased 1976. L 122 mm, W 30 mm, W with pocket for hook 15 mm. NMHT 1977.0789.17.

Fleam, 19th century. Brass shield with five blades. An arrow is stamped on one side of the shield. Purchased 1976. L 88 mm, W 27 mm. NMHT 1977.0789.18.

Fleam, 19th century. Brass shield with three different sized blades. Case is inscribed "Gorham Parsons, Byfield." Purchased 1976. L 88 mm, W 30 mm. NMHT 1977.0789.19.

Fleam, 19th century. Brass case with three different sized blades. Purchased 1976. L 82 mm, W 26 mm. NMHT 1977.0789.20.

Fleam, 19th century. Brass shield with five blades and one hook. On one side of the case appears indistinctly, "HOW: IN London" on each of the blades except the straight blade and the hook. Purchased 1976. L 85 mm, W 23 mm. NMHT 1977.0789.21.

Fleam, 19th century. Five blades in a brass case. On two of the blades appears "How: in LONDON." Purchased 1976. L 80 mm, W 22 mm. NMHT 1977.0789.23.

Fleam with case, 19th century. Four blades in brass case. Purchased 1976. L 95 mm, W 25 mm. NMHT 1977.0789.22.

Fleam, 19th century. Brass case with three blades. Purchased 1976. L 94 mm, W 32 mm. NMHT 1977.0789.25.

Fleam, 19th century. Three blades in brass case. Purchased 1976. L 83 mm, W 29 mm. NMHT 1977.0789.26.

Fleam, 19th century. Single blade in brass case. On blade is marked "ARNOLD & SONS LONDON." Purchased 1976. L 98 mm, W 38 mm. NMHT 1977.0789.27.

Fleam, 19th century. Fleam has a horn shield and two blades engraved "J & S Maw/London." Horn shield is broken on one side, and has openings for a thumb lancet on each side. Only one thumb lancet with tortoise shell shield remains. Purchased 1976. L 84 mm, W 28 mm. NMHT 321697.12.

Fleam, 19th century. Fleam has a horn shield and three blades. Purchased 1976. L 83 mm, W 26 mm. NMHT 321697.13.

Fleam, 19th century. Fleam has a horn shield and three blades; "G. Gregory Cast Steel." Purchased 1976. L 87 mm, W 31 mm. NMHT 321697.14.

Fleam, 19th century. Fleam has a horn shield and one blade. Blade is engraved "Arnold and Sons/Smithfield." Purchased 1976. L 97 mm, W 37 mm. NMHT 321697.15.

Fleam, 19th century. Fleam has a horn shield, two blades, and is engraved "Borwick." Purchased 1976. L 82 mm, W 27 mm. NMHT 321697.16.

Spring Lancets

Spring lancet, patent model, 1849. Lancet is brass and oval shaped. A wheel and axle mechanism allows the blade to sweep out an elliptical curve. Lancet is set by a detachable key and released by a lever protruding from the side. Lever is missing or hidden inside the case and the mechanism is frozen. Patented in 1849 by Joseph Ives of Bristol, Connecticut (U.S. patent 6240). Transferred from the U.S. Patent Office 1926. L 97 mm, W 33 mm, H 14 mm. Neg. 73–4211 (BW, CS). NMHT 89797 (M–4292). (Figure 23.)

Spring lancet, patent model, 1880. Instrument is made of brass and shaped like a gun. The cocking lever is attached to both a coiled spring in the handle of the gun and an extension of the blade. Pushing the trigger injects the blade. Blade is dart form with double beveled edges, as was typical of veterinary fleams. Patented by Hermann Reinhold and August Schreiber of Davenport, Iowa (U.S. patent 236084). Transferred from the U.S. Patent Office 1926. L 105 mm (to tip of blade), H 77 mm. Neg. 73–4210 (BW, CS). NMHT 89797 (M–4327). (Figure 24.)

Spring lancet with case, 19th century. Brass knob end lancet, a larger version of the spring lancet used in human phlebotomy. Case is also similar to the spring lancet cases for human use. It is made of wood covered with brown leather, lined with chamois, and closed by a latch. Case has a chalice decoration on top. Donated by Dr. A. J. Olmstead 1945. Lancet: L 74 mm, W 38 mm. Case: L 133 mm, W 60 mm, H 33 mm. NMHT 171080 (M–6418).

Spring lancet, 19th century. Veterinary lancet similar to the previous lancet except that the blade is larger and provided with a blade guard. Blade guard can be set by a screw in order to regulate the size of the blade. Stamped on back panel is "F. Leypoldt/Phila." This is presumably the same Frederick Leypoldt who patented two scarificators, one in 1847 and one in 1851. Donated by the University of Pennsylvania 1959. L 74 mm, W 34 mm. Neg. 76–7757 (BW, CS), compares lancet to one used in human phlebotomy, NMHT 218383 (M–9256). (Figure 22.)

Spring lancet with case, 19th century. Brass knob end lancet with large blade and blade guard. Lancet has a rim around the top and a lever release molded to resemble a torch. Case is lined with black plush and covered with black cloth. Purchased 1976. Lancet: L 85 mm (not including blade), W 40 mm. Case: L 142 mm, W 78 mm, H 39 mm. NMHT 316478.

Spring lancet with case, 19th century. Instrument is made of brass and has a ball-shaped handle. The blade is double beveled, typical of blades for veterinary bleeders. The ball handle contains a spring that is attached to a small projecting cylinder with string tied to it. By pulling on the string, one can pull the blade in, and by pushing a button one can inject the blade. Case is made of wood covered with leather and is coffin-shaped. Purchased 1976. L 95 mm (to tip of blade), D of ball 34 mm. Neg. 76–7750 (BW, CS). NMHT 321697.07. (Figure 104.)

Spring lancet with case, 19th century. Lancet is brass and has a triangular shape. It is triggered by a slide catch on the front of the instrument. The triggering handle is a detachable piece that lifts off a square peg. Hinged from the side is a curved piece for ease in holding. Screw on front of the instrument probably regulates blade depth and a rectangular button at the top corner probably releases the blade. Mechanism is jammed and the blade is hidden within the instrument. Only the bottom half of the case remains. Purchase 1976. L 83 mm, W 59 mm. Neg. 76–7756 (BW, CS). NMHT 321697.08. (Figure 119.)

Spring lancet, late 18th-early 19th century. Triangular-shaped lancet made of brass and iron and decorated with a floral design. Blade (missing) is attached to an iron lever, which, when pulled back, is held in place by a lever with ratchets attached to the facing side of the instrument. Pressing upon this same lever releases the ratchets and injects the blade. Purchased 1976. H 97 mm, W 80 mm. Neg. 76–7755 (BW, CS). NMHT 321697.09. (Figure 120.)

Spring lancet with case, 18th century. This rather elegant lancet consists of a body and a detachable handle. According to analysis by the Conservation Laboratory, the lancet is made of ferrous metal (iron or steel). Blade is screwed into a curved lever. Pulling upon the handle pulls back the lever with the blade, and releasing the handle releases the blade. Case is made of wood, covered with black leather and lined with green silk and green plush. Seller says that the lancet was made in England, ca. 1700. This date seems somewhat too early. Purchased 1976. H 112 mm, W 72 mm (to tip of blade). Neg. 76–7753 (BW, CS). NMHT 321697.10. (Figure 121.)

Spring lancet, 19th century. Instrument is made of brass and has an odd, irregularly curved shape. A large blade with a blade guard protrudes from the side. Blade is triggered by an iron slide catch on the front of the instrument and released by a brass lever release similar to that found in knob end lancets. Purchased 1976. L 138 mm, W 82 mm (to tip of blade). Neg. 76–7754 (BW, CS). NMHT 321697.11. (Figure 103.)

Spring lancet, 19th century. Instrument is made of brass with steel screws. It is inscribed on one side: "Weiss improved bleeding instrument 33 Strand London." There is a brass guard on the blade that can be moved along the blade by a screw attached directly opposite the blade. It fits into a red leather case with beige velvet lining. The case closes with two brass hooks. Purchased 1976. Case: L 92 mm, W 75 mm. Height without lever 66 mm, Width at widest point 64 mm, overall width 12 mm. Neg. 77–13961 (BW, CS) NMHT 1977.0576.01. (Figure 122.)

Related Artifacts

Counter-irritation device, patent model, 1860. Improved version of Baunscheidt's *Lebenswecker* patented by Alfred Stauch of Philadelphia (U.S. patent no. 28697). Stauch added a brush around the needles and an additional spring to force the needles back after they had entered the skin. The brush could be oiled before the operation, thus saving the need to oil the wound afterwards. The device is similar to the *Lebenswecker* in size and construction, except that it was made of a lighter colored wood and was trimmed in brass. Transferred from the U.S. Patent Office 1926. L 245 mm, D 20 mm. Neg. 72–11290 (BW). NMHT 89797 (M–4299).

Counter-irritation device, patent model, 1866. Patented by Friederich Klee of Williamsburg, New York (U.S. Patent 55775), this instrument is another modification of Baunscheidt's *Lebenswecker*. It is made of wood and brass, and is much shorter than the *Lebenswecker* but operated in the same manner. A screw on the handle served to regulate the length of the needles. A further innovation was the addition of a diaphragm of leather through which the needles pass. The leather could be saturated with oil before the operation, thus again saving the need to apply oil afterwards. Transferred from the U.S. Patent Office 1926. L 92 mm. Neg. 72–11274. NMHT 89797 (M–4305). (Figure 123.)

Barber-surgeon's kit, late 18th- early 19th century. Kit includes a teakettle lamp (M–6991), a deck of playing cards to amuse customers, four standard glass cupping cups (M–6686), two scarificators (M–6687, M–6688), two rectangular spring lancets in a case (M–6689), a dental kit, a barber kit, a tourniquet M–6692), and a comb. Scarificators are both 16 blade square models. One is unusual in that only the bottom is detachable as in octagonal scarificators. The spring lancets are of an unusual shape, with straight edges and curved tops and bottoms. Donated by Mrs. Frank J. Delinger, Jr., through Mrs. Paul J. Delinger, 1953. Lamp: D of base 65 mm, W 145 mm, H 95 mm. Spring lancets: L 49 mm, W 18 mm. Tourniquet: L 1260 mm, W 35 mm. Neg. 73–4207, entire kit plus barber's basin (NMHT 225114 [M–9399]), which is not part of kit; 73–4225, cups; 73–4219, two scarificators; 73–4221, dental set; 73–4222, barber set; 73–4223, deck of cards; 73–4224, tourniquet; 73–4234, set of spring lancets; 73–4218, teakettle lamp. All negatives BW, CS. NMHT 199536 (M–6684 to M–6693).

Barber-surgeon's sign (replica). Reproduction of a 1623 barber-surgeon's sign (original is in Wellcome Medical Museum) illustrating the various specialties of the barber-surgeon of the period. Phlebotomy is shown in the upper right hand corner. Made by Richard Dendy of London and donated by him 1958. L 724 mm, W 624 mm. Neg. 44681 (BW). NMHT 215690 (M–7343). (Figure 32.)

Greek votive tablet (replica). Reproduction of a Greek votive tablet found on the site of the Temple of Aesculapius. The original is in the Athens Museum. Illustrated are two metal cupping cups and a case containing six scalpels. Replica made by Dorothy Briggs of the Smithsonian Institution 1960. W 400 mm, H 295 mm, Thickness 30 mm. Neg.

73–4217 (BW, CS). NMHT 233055 (M–9617). (See Figure 54.)

Greek vase (replica). Reproduction of a small Greek vase depicting a 5th century B.C. medical "clinic," including a Greek physician bleeding a patient. Original is in the Louvre. Made by Dorothy Briggs of the Smithsonian Institution 1960. H 85 mm, W 75 mm. Neg. 73–4216 (BW, CS); 73–4216–A (CS), red background. NMHT 233055 (M–9618). (Figure 26.)

Bloodletting manikin, 15th century. Pen and ink drawing in black and red inks on a folded sheet of paper with the watermark "Ochsenkapf mit Krone" reportedly made in Southern Germany in 1480. The paper is backed at the fold by a piece of vellum. Drawing is of a man with astrological signs and instructions in German in balloons pointing at 25 points of his body, of which 4 are symmetrical. Such a drawing used in conjunction with a dial would be used to determine when and where to bleed. On the reverse are astronomical tables. According to analysis by the Conservation Laboratory at the Smithsonian, the paper might well date from the 15th century and the ink has been applied at various times. Purchased 1962. L 310 mm, W 225 mm. Neg. 76–13536 (BW). NMHT 243033 (M–10288).

Surgeon's kit, late 18th century. Revolutionary War surgeon's kit includes a leather case with brass handle, three pewter cupping cups, a spring lancet, syringe, two trocars, knife, probe, and scraper. There is space for two other missing instruments, one of which may have been a scarificator. Lancet has an unusual boot shape and is decorated with a floral design. It is made of brass and has a steel lever release. Purchased 1969. Neg. 73–4237–A (CS). NMHT 285125 (M–12352).

Baunscheidt's *Lebenswecker,* mid 19th-early 20th century. Carl Baunscheidt of Bonn exhibited his *Lebenswecker* ("Life Awakener") at the Great Exhibition in London in 1851. It consists of a long hollow tube made of ebony and containing a coiled spring attached to a handle. A cap covers a plate with some thirty sharp needles. Pushing upon the handle injects the needles into the skin. The devise was used with Baunscheidt's special oil, which was applied to the skin after the needles had irritated it. Donated by Grace Sutherland 1970. L 250 mm, W 30 mm. Neg. 76–7751 (BW). NMHT 287885 (M–12936). (Figure 79.)

Baunscheidt's *Lebenswecker,* mid 19th-early 20th century. Another example of the previous instrument. Donated by Mrs. William F. Press 1970. L 245 mm, W 20 mm, H 25 mm. NMHT 290304 (M–13832).

Baunscheidt's *Lebenswecker,* mid 19th-early 20th century. Another example of the previous instruments. Purchased 1976. NMHT 1977.0789.

Alcohol lamp, late 19th–early 20th century. Glass lamp with glass cap and cotton wick, used in exhausting air from cups. Used by Dr. F. L. Orsinger of Chicago (1852–1925). Donated by Dr. William H. Orsinger 1973. H 100 mm, D 83 mm. Neg. 74–4086 (BW, CW). NMHT 308730.08.

Junod's boot, 19th–early 20th century. Copper boot first introduced by Victor-Theodore Junod in the 1830s. The boot fits tightly about the foot and air is exhausted from it by means of a pump. John S. Billings described the boot as "An apparatus for enclosing a limb, and from which air can be exhausted so as to produce the effect of a large cupping glass." (*The National Medical Dictionary*. Philadelphia, 1890 p. 732.) On loan from the Armed Forces Institute of Pathology. L 280 mm, H 430 mm. Neg. 73–7885 (BW). (Figure 81.)

Barber pole, ca. 1890–1900. This small, red, white, and blue striped pole, with a newel post and no globe on the top, was used in Binghamton, New York. The colors are faded into an orange and tan color. Purchased 1974. Pole L 2600 mm, W at widest point 900 mm. NMHT 312616.

Barber pole, ca. 1920. A red, white, and blue striped pole full size. It has a silver wooden top. It was used in New Jersey. Pole: L 63 mm, W at widest point 20 mm. Top: L 33 mm. Gift of H. E. Green. NMHT 322,655.01.

NOTES

[1] Julius Gurlt's bibliographical essay on bloodletting, originally published in 1898, is a prime source for tracing in detail the specific contributions of European and Asian authors in the ancient, medieval, and Renaissance periods. See JULIUS GURLT, *Geschichte der Chirurgie und ihrer Ausuebung* (Hildesheim: Georg Olms, 1964), volume 3, page 556–565.

[2] GEORGE F. KNOX, *The Art of Cupping* (London, 1836), page 30.

[3] For a general history of bloodletting, see TOWNSEND W. THORNDIKE, "A History of Bleeding and Leeching," *British Medical and Surgical Journal,* volume 197, number 12 (Septemper 1927), pages 437–477. For a detailed account of ancient bloodletting, see RUDOLPH SIEGEL, "Galen's Concept of Bloodletting in Relation to His Ideas on Pulmonary and Peripheral Blood Flow and Blood Formation" (chapter 19 in volume 1 of *Science, Medicine and Society in the Renaissance* edited by Allen Debus, New York: Science History Publications, 1973), pages 247–275.

[4] ROBERT MONTRAVILLE GREEN, "A Translation of Galen's Temperaments and Venesection" (manuscript, Yale Medical Library, New Haven, Connecticut), page 102.

[5] Ibid., page ii-iv.

[6] CELSUS, *De Medicina,* translated by W. G. Spencer (Cambridge: Harvard University Press, 1960), volume 1, book 2, page 155.

[7] HENRY E. SIGERIST, *A History of Medicine* (New York: Oxford University Press, 1961), volume II, pages 317–335.

[8] GREEN, op. cit. [note 4], page 105.

[9] PETER H. NIEBYL, "Galen, Van Helmont and Blood Letting," (chapter 21 in volume 2 of *Science, Medicine and Society in the Renaissance* edited by Allen Debus, New York: Science History Publications, 1972); PETER NIEBYL, "Venesection and the Concept of the Foreign Body: A Historical Study in the Therapeutic Consequences of Humoral and Traumatic Consequences of Diseases" (doctoral dissertation, Yale University, 1969), page 156.

[10] GREEN, op. cit. [note 4], page 171.

[11] Ibid., page 114.

[12] Ibid., page 173.

[13] Ibid., pages 174, 180.

[14] CELSUS, op. cit. [note 6], page 163.

[15] CHARLES H. TALBOT, *Medicine in Medieval England* (London: Oldbourne, 1967), pages 127–131.

[16] CHARLES D. O'MALLEY, *Andreas Vesalius of Brussels 1514–1564* (Berkeley and Los Angeles: University of California Press, 1964), pages 66–67.

[17] See, for example, M. DAVID, *Recherches sur la manière d'agir de la saignée et sur les effets qu'elle produit relativement à la partie ou on la fait* (Paris, 1762), page iv.

[18] LORENZ HEISTER, *Chirurgie, in welcher alles, was zur wund artzney gehöret . . .* (Nuremberg, 1719).

[19] GREEN, op. cit. [note 4], page 179.

[20] JOSEPH T. SMITH, SR., "An Historical Sketch of Bloodletting," *Johns Hopkins Hospital Bulletin,* volume 21 (1910), page 312.

[21] MARSHALL HALL, *Observations on Bloodletting Founded upon Researches on the Morbid and Curative Effects of Loss of Blood* (London, 1836), page 280.

[22] ROBLEY DUNGLISON, *Medical Lexicon—A Dictionary of Medical Science* (Philadelphia, 1848), page 820.

[23] JAMES E. BOWMAN, "Blood," *Encyclopaedia Britannica* (Chicago: William Benton, 1972), volume 34, pages 795–800.

[24] GREEN, op. cit. [note 4], page 187.

[25] KARL SUDHOFF, *Deutsche medizinische Inkunabeln* (Leipzig, 1908); Studien zur Geschichte der Medizin heft 2/3. SIR WILLIAM OSLER, *Incunabula Medica: A Study of the Earliest Printed Medical Books, 1467–1480* (Oxford: Oxford University Press, 1923).

[26] FRANCISCO GUERRA, "Medical Almanacs of the American Colonial Period," *Journal of the History of Medicine and Allied Sciences,* volume 16 (1961), pages 235–237. The number of veins illustrated in the vein man varied a great deal but became fewer after the seventeenth century.

[27] TALBOT, op. cit. [note 15], pages 127–131.

[28] GUERRA, op. cit. [note 26], pages 237; MARION BARBER STOWELL, *Early American Almanacs: The Colonial Weekday Bible* (New York: Burt Franklin, 1977). The latter work contains numerous illustrations of "anatomies" from colonial almanacs.

[29] "Original Letters," General William F. Gordon to Thomas Walker Gilmar, 11 December 1832, *William and Mary Quarterly,* volume 21 (July 1912), page 67.

[30] TALBOT, op. cit. [note 15], pages 50, 51. For another view of the religious impact upon medieval medical and surgical practices, see JAMES J. WALSH, *The Popes and Science* (New York: Fordham University Press, 1908), pages 167–198.

[31] THORNDIKE, op. cit. [note 3], page 477.

[32] MIGUEL DE CERVANTES SAAVEDRA, *Don Quixote de la Mancha,* translated by Walter Starkie New York: Mentor, 1963), pages 91, 92.

[33] CHARLES ALVERSON, "Surgeon Abel's Exotic Bleeding Bowls," *Prism,* volume 2 (July 1974), pages 16–18; JOHN K. CRELLIN, "Medical Ceramics," in *A Catalogue of the English and Dutch Collections in the Museum of the Wellcome Institute of the History of Medicine* (London: Wellcome Institute of the History of Medicine, 1969), pages 273–279.

[34] THORNDIKE, op. cit. [note 3], page 477; CAREY P. MCCORD, "Bloodletting and Bandaging," *Archives Environmental Health,* volume 20 (April 1970), pages 551–553.

[35] LEO ZIMMERMAN and VEITH ILZA, *Great Ideas in the History of Surgery* (New York: Dover Books, 1967), page 126.

[36] WILLIAM HARVEY, *Works,* edited by Robert Willis (London: Sydenham Society, 1847), page 129. Harvey reaffirmed later: "I imagine that I shall perform a task not less new and

useful than agreeable to philosophers and medical men, if I here briefly discourse of the causes and uses of the circulation, and expose other obscure matters respecting the blood" (page 381).

[37] HENRY STUBBE, *The Lord Bacons Relation of the Sweating-Sickness Examined . . . Together with a Defense of Phlebotomy . . .* (London, 1671), page 102.

[38] FIELDING H. GARRISON, "The History of Bloodletting," *New York Medical Journal,* volume 97 (1913), page 499. Magendie was firmly opposed to bloodletting and ordered physicians working under him not to bleed. However, their belief in the practice was so strong that they disobeyed his instructions and carried out the procedure. See ERWIN ACKERKNECHT, *Therapeutics from the Primitives to the 20th Century* (New York: Hafner, 1973), pages 111–112.

[39] AUDREY B. DAVIS, *Circulation Physiology and Medical Chemistry in England, 1650–1680* (Lawrence, Kansas: Coronado Press, 1973), pages 135, 167, 219. For the history of injecting remedies into the blood, see HORACE M. BROWN, "The Beginnings of Intravenous Medication," *Annals of Medical History,* volume 1 (1917), page 182.

[40] ARTURO CASTIGLIONI, *A History of Medicine,* translated from Italian by E. B. Krumbhar, 2nd edition, revised and enlarged (New York: Alfred A. Knopf, 1958), page 444; NIEBYL, "Venesection" [note 9], page 414.

[41] JOAN LILLICO, "Primitive Bloodletting," *Annals of Medical History,* volume II (1940), page 137.

[42] C.J.S. THOMPSON, *Guide to the Surgical Instruments and Objects in the Historical Series with Their History and Development* (London: Taylor and Francis, 1929), page 40.

[43] JOHN STEWART MILNE, *Surgical Instruments in Greek and Roman Times* (New York: Augustus M. Kelley, 1970), reprint of 1907 edition, pages 32–35. A bronze knife of this type is illustrated in THEODOR MEYER-STEINEG, *Chirurgische Instrumente des Altertum* (Jena: Gustav Fischer, 1912), page iv, figure 9. The instrument was donated by Dr. Nylin of the Kardinska Institute in Stockholm, who used a lancet until 1940. Replicas of the early bronze medical instruments were sold in 1884 by Professor Francesco Scalzi of Rome. He exhibited 45 of them at the Exposition Universelle de Paris in 1878. He won an honorable mention award, "Collezione di Istrumenti Chirurgici de Roma Antica," 1884.

[44] S. HOLTH, "Greco-Roman and Arabic Bronze Instruments and Their Medico-Surgical Use," *Skriften utgit an Videnskapsselskapet I Kristrania* (1919), page 1 (below). Holth lists the content of lead, tin, zinc, iron, copper, and cobalt found in a number of ancient bronze medical items in his collection, which formerly belonged to Baron Ustinov of Russia. These instruments were unearthed in Syria and Palestine from 1872 to 1890.

[45] An occasional curious item like the spring lancet on display in the Welch Medical Library of the Johns Hopkins University is an exception.

[46] MILNE, op cit. [note 43], pages 35–36.

[47] LAURENCE HEISTER, *A General System of Surgery in Three Parts,* translated into English (London, 1759), 7th edition, page 294.

[48] GURLT, op. cit. [note 1], volume III, page 558.

[49] G. GAUJOT and E. SPILLMAN, *Arsenal de la Chirurgie Contemporaine* (Paris: J. B. Bailliere et fils, 1872), pages 274–276.

[50] MILNE, op. cit. [note 43], page 33.

[51] GARRISON, op. cit. [note 38], page 433.

[52] SIR WILLIAM FERGUSON, *Lectures on the Progress of Anatomy and Surgery during the Present Century* (London: John Churchill & Sons, 1867), page 284.

[53] JAMES EWELL, *The Medical Companion* (Philadelphia, 1816), pages 405, 406.

[54] For an illustration of incisions, see HEISTER, 1759), op cit. [note 47].

[55] MILNE, op. cit. [note 43], page 36.

[56] GURLT, op. cit. [note 1], volume III, page 556.

[57] P. Hamonic describes an eighteenth-century Naples porcelain figure of a woman being bled that illustrates the elegant manner in which the operation was performed. P. HAMONIC, *La Chirurgie et la medécine d'autrefois d'aprés une première série d'instruments anciens renfermes dans mes collections* (Paris: A. Maloine, ed., 1900), pages 91, 93.

[58] THOMAS DICKSON, *A Treatise on Bloodletting with an Introduction Recommending a Review of the Materia Medica* (London, 1765), page 1.

[59] SIR D'ARCY POWER, editor, *British Medical Societies* (London: The Medical Press Circular, 1939), page 23.

[60] Wakeley was a heretic wealthy doctor who led the campaign in Britain against the monopoly of surgical training and practice held by the Royal College of Surgeons of London. ALAN ARNOLD KLASS, *There's Gold in "Them Thar Pills"* (Baltimore: Penguin Books, 1975), pages 158–159.

[61] JOHN HARVEY POWELL, *Bring Out Your Dead* (Philadelphia: University of Pennsylvania Press, 1949), page 123.

[62] See, e.g., RICHARD SHRYOCK, *Medicine and Society in America: 1660–1860* (New York: New York University Press, 1960), pages 67, 111–112.

[63] JAMES T. FLEXNER, *George Washington: Anguish and Farewell* (Boston: Little, Brown, 1972), pages 457–459.

[64] BARBARA DUNCUM, *The Development of Inhalation Anesthesia,* (The Wellcome Historical Medical Museum, Oxford University Press, 1947), page 195.

[65] HAMONIC, op. cit. [note 57], pages 95–96.

[66] DONALD D. SHIRA, "Phlebotomy Lancet," *Ohio State Medical Journal,* volume 35 (1939), page 67.

[67] HEISTER, (1719) loc. cit. [note 18].

[68] *Encyclopedia or Dictionary of the Arts and Sciences,* 1st American edition (Philadelphia, 1798).

[69] RISTELHUEBER, "Notice: sur la flammette, phlébotome des Allemands, Fliete, Schnepper oder gefederte Fliete, phlebotomus elasticus, Flamme ou flammette," *Journal de Médecine, chirurgie et pharmacologie,* volume 37 (Paris, 1816), pages 9–17.

[70] JOHN SYNG DORSEY, *Elements of Surgery: For the Use of Students,* volume 2 (Philadelphia, 1813), pages 279–281.

[71] Patent specifications, U.S. patent 16479.

[72] M. MALGAIGNE, "Esquisse historique sur la saignée considérée au point de vue opératoire; extrait des leçons du Professeur Malgaigne," *Revue Medico Chirurgicale de Paris,* volume 9 (1851), page 123.

[73] GARRISON, op. cit. [note 38], page 501.

[74] Some of these studies are cited in B. M. RANDOLPH, "The

Bloodletting Controversy in the Nineteenth Century," *Annals of Medical History,* volume 7 (1935), page 181.

[75] Quotation cited by LESTER S. KING, "The Blood-letting Controversy: A Study in the Scientific Method," *Bulletin of the History of Medicine,* volume 35 (1961), page 2.

[76] MARTIN KAUFMANN, *Homeopathy in America* (Baltimore: Johns Hopkins Press, 1971), pages 1–14. Other references on the decline of bloodletting include: LEON S. BRYAN, JR., "Blood-letting in American Medicine, 1830–1892," *Bulletin of the History of Medicine,* volume 38 (1964), pages 516–529; B. M. RANDOLPH, op. cit. [note 74], pages 177–182; JAMES POLK MORRIS, "The Decline of Bleeding in America, 1830–1865" (manuscript, Institute for the Medical Humanities, University of Texas Medical Branch, Galveston, Texas), 11 pages.

[77] HENRY I. BOWDITCH, *Venesection, Its Abuse Formerly—Its Neglect at the Present Day* (Boston: David Clapp & Son, 1872), pages 5, 6.

[78] W. MITCHELL CLARKE, "On the History of Bleeding, and Its Disuse in Modern Practice," *The British Medical Journal* (July 1875), page 67.

[79] HENRY LAFLEUR, "Venesection in Cardiac and Arterial Disease," *The Johns Hopkins Hospital Bulletin,* volume 2 (1891), pages 112–114.

[80] See, for example, JOHN REID, *"Bleeding," Essays on Hypochrondriasis and Other Nervous Affections* (London, 1821), essay 22 page 334.

[81] AUSTIN FLINT, *A Treatise on the Principles and Practice of Medicine,* 3rd edition (Philadelphia, 1868), page 150.

[82] MARTIN DUKE, "Arteriosclerotic Heart Disease, Polychthenic and Phlebotomy—Rediscovered," *Rhode Island Medical Journal,* volume 48 (1965), page 477.

[83] SAMUEL LEVINE, Editorial, "Phlebotomy, An Ancient Procedure Turning Modern?," *Journal of the American Medical Association* (January 26, 1963), page 280.

[84] GEORGE BURCH and N. P. DEPASQUALE, "Phlebotomy Use in Patients with Erythrocytosis and Ischemic Heart Disease," *Archives of Internal Medicine,* volume 3 (June 1963), pages 687–695. See also GEORGE BURCH and N. P. DEPASQUALE, "Hematocrit, Viscosity and Coronary Blood Flow," *Diseases of the Chest,* volume 48 (September 1965), pages 225–232.

[85] HEINRICH STERN, "A Venepuncture Trocar (Stern's Trocar)," *Medical Record* (December 1905), pages 1043, 1044.

[86] DELAVAN V. HOLMAN, "Venesection, Before Harvey and After," *Bulletin New York Academy of Medicine,* volume 31 (September 1955), pages 662, 664.

[87] SAMUEL BAYFIELD, *A Treatise on Practical Cupping* (London, 1823), page 11.

[88] CELSUS, *De Medicina,* op. cit. [note 6], page 169. For bibliography on cupping, see WILLIAM BROCKBANK, *Ancient Therapeutic Arts* (London: William Heinemann, 1954); JOHN HALLER, "The Glass Leech: Wet and Dry Cupping Practices in the Nineteenth Century," *New York State Journal of Medicine* (1973), pages 583–592; BROCHIN, "Ventouses," *Dictionnaire encyclopédique des sciences médicales,* series 5, volume 2 (1886), pages 750–752; and, the *Index Catalogue of the Library of the Surgeon-General's Office, U.S. Army.*

[89] HIPPOCRATES, *Aphorisms,* V, page 50.

[90] THOMAS MAPLESON, *A Treatise on the Art of Cupping* (London, 1813), opposite page 1.

[91] GURLT, op. cit. [note 1], volume 3, page 151.

[92] CHARLES COURY, "Saignées, ventouses et cautérisations dans le médecine orientale à l'époque de la Renaissance," *Histoire de la médecine,* volume 11 (November-December 1961), pages 9–23.

[93] W. A. GILLESPIE, "Remarks on the Operation of Cupping, and the Instruments Best Adapted to Country Practice," *Boston Medical and Surgical Journal,* volume 10 (1834), page 28.

[94] Letter from Rev. Robert Richards to Dr. Sami Hamarneh, 1 September 1966 (Division of Medical Sciences, Museum of History and Technology).

[95] On ancient cups, see CELSUS, op. cit. [note 6], pages 165–167; Milne, op cit. [note 43], pages 101–105 and plates; and BROCKBANK, op. cit. [note 88], pages 65–72. The Institute of the History of Medicine, Johns Hopkins University, has several metal cups dating from about A.D. 100.

[96] CASTIGLIONI, op. cit. [note 40], page 380.

[97] PIERRE DIONIS, *Cours d'opérations de chirurgie demonstrées au Jardin Royal* (Paris, 1708), page 584.

[98] RÉNÉ JACQUES CROISSANTE DE GARENGEOT, *Nouveau Traité des Instrumens de Chirurgie les plus utiles* (The Hague, 1725), page 342.

[99] DIONIS, op. cit. [note 97], page 585.

[100] MAPLESON, op. cit. [note 90], pages 27–28. See also GEORGE FREDERICK KNOX, op. cit. [note 2], page 29.

[101] MAPLESON, op. cit. [note 90]; BAYFIELD, op. cit. [note 87]; KNOX, op. cit. [note 2]; and MONSON HILLS, "A Short Treatise on the Operation of Cupping," *Boston Medical and Surgical Journal,* volume 9 (1834), pages 261–273.

[102] KNOX, op. cit. [note 2], page vi.

[103] BAYFIELD, op. cit. [note 87], page 125.

[104] DIONIS, op. cit. [note 97], page 587 and figure 57 on page 583.

[105] KNOX, op. cit. [note 2], page 33.

[106] JOHN H. SAVIGNY, *A Collection of Engravings representing the Most Modern and Approved Instruments Used in the Practice of Surgery* (London, 1798), plate 7. For the earlier grease lamp, see J. A. BRAMBILLA, *Instrumentarium Chirurgicum Viennense oder Wiennerliche Chirurgische Instrumenten Sammlung* (Vienna, 1780), plate 2.

[107] BAYFIELD, op. cit. [note 87], page 123; KNOX, op. cit. [note 2], page 33; HILLS, op. cit. [note 101], page 263.

[108] See DIONIS, op. cit. [note 97], page 587 and figure 58 on page 583; and LAURENCE HEISTER, op. cit. [note 47], page 329 and plate 12. The parallel incisions were described in antiquity by Oribasius (ca. A.D. 360), the most important medical author after Galen and the friend of the emperor Julian. See GURLT, op. cit. [note 1], volume 3, page 563.

[109] AMBROISE PARÉ, *The Collected Works of Ambroise Paré,* translated by Thomas Johnson (London, 1634). Reprint edition (Pound Ridge, New York: Milford House, 1968), page 446. The drawing first appeared in Paré's treatise "Methode de traiter des playes de la teste" in 1561.

[110] PAULUS AEGINETA, *Medicinae Totius enchiridion* (Basileae, 1541), page 460.

[111] ALBERT WILHELM HERMANN SEERIG, *Armamentarium chirurgicum oder möglichst vollständige Sammlung von Abbildungen und Beschreibung Chirurgischer Instrument alterer und neuerer Zeit* (Breslau, 1838), page 598.

[112] JACQUES DELECHEMPS, *Chirurgie Françoise Recueillie* (Lyon, 1564, page 174; HELLKIAH CROOKE. *Micrographia: A*

Description of the Body of Men . . with an Explanation of the Fashion and Use of Three & Fifty Instruments of Chirurgy (London, 1631).

[113] GARENGEOT, op. cit. [note 98], pages 347, 351.

[114] HEISTER (1719), op. cit. [note 18], page 329. Lorenz Heister . . . *Chirurgie* . . . (Nuremberg, 1719) includes the same picture of the scarificator as the 1759 English translation.

[115] HEISTER (1759), op. cit. [note 47], page 330.

[116] See BRAMBILLA, op. cit. [note 106], plate 2; DENIS DIDEROT, *Dictionnaire risonné des sciences, arts et métiers. Recueil des planches* (Lausanne and Berne, 1780), volume 2, plate 23; and BENJAMIN BELL, *A System of Surgery,* 5th edition (Edinburgh, 1791), volume 1, plate 5.

[117] JAMES LATTA, *A Practical System of Surgery* (Edinburgh, 1795), volume 1, plate 1; BENJAMIN BELL, *A System of Surgery,* 7th edition Edinburgh, 1801), volume 3, plate 7.

[118] JOHN WEISS, *An Account of Inventions and Improvements in Surgical Instruments Made by John Weiss, 62, Strand,* 2nd edition (London, 1831), pages 12–13. A Mr. Fuller introduced a similar improvement, which Weiss claimed Fuller had pirated from him. The only difference between Weiss's Improved Scarificator and Fuller's Improved Scarificator was that the blades in Weiss's were arch shaped and those of Fuller's crescent shaped. The cupper, Knox, preferred the crescent blades because they gave a sharper cut. In any case, most nineteenth-century scarificators were made with crescent-shaped blades. On Fuller's scarificator, see BAYFIELD, op. cit. [note 87], pages 99–100; and, SEERIG, op. cit. [note 111], pages 604–605 and plate 56.

[119] *Extract du Catalogue de la maison Charrière* (Paris, 1843), page 30; KNOX, op. cit. [note 2], pages 39, 40.

[120] This statement is based on the perusal of a wide variety of nineteenth-century trade catalogs. See "List of Trade Catalogs Consulted."

[121] KNOX, op. cit. [note 2], page xii.

[122] Ibid., pages 14–15.

[123] HILLS, op. cit. [note 101], page 266.

[124] BAYFIELD, op. cit. [note 87], page 116.

[125] KNOX, op. cit. [note 2], pages 53–64.

[126] Ibid., page 68.

[127] HERO OF ALEXANDRIA, *The Pneumatics of Hero of Alexandria,* translated by Bennet Woodcroft (London, 1851).

[128] GURLT, op. cit. [note 1], volume 2, page 565 and plate X.

[129] BRAMBILLA, op. cit. [note 106], page 42, mentioned but did not picture a cup with air pump. One of the earliest illustrations of a cup with pump is found in SAVIGNY, op. cit. [note 106], plate 7.

[130] MAPLESON, op. cit. [note 90], page 63.

[131] KNOX, op. cit. [note 2], page 32.

[132] JOHN READ, *A Description of Read's Patent Syringe Pump* (London, no date). See also JOHN READ, *An Appeal to the Medical Profession on the Utility of the Improved Patent Syringe,* 2nd edition (London, ca. 1825).

[133] WEISS, op. cit. [note 118], page 87; CHAS. TRUAX, GREENE & Co., *Price List of Physicians' Supplies,* 6th edition (Chicago, 1893), pages 989–1010.

[134] "Notice sur l'acupuncture et sur une nouvelle espèce de ventouse armée de lancettes, inventée par A. -P. Demours," *Journal universal des sciences médicales,* volume 15 (1819), pages 107–113; BAYFIELD, op. cit. [note 87], pages 73–81.

[135] THOMAS MACHELL, "Description of an Apparatus for Cupping, Dry Cupping, and Drawing the Breasts of Females; With some Observations Respecting Its Use," *London Medical and Physical Journal,* volume 42 (1819), pages 378–380; BAYFIELD, op. cit. [note 87], pages 81–89.

[136] BAYFIELD, op. cit. [note 87], pages 92–93.

[137] ROBERT J. DODD, "Improved Cupping Apparatus," *The American Journal of the Medical Sciences,* new series, volume 7 (1844), page 510. See also patent specifications, U.S. patent 3537.

[138] Patent specifications, U.S. patent 68985.

[139] HILLS, op. cit. [note 101], page 261.

[140] GILLESPIE, op. cit. [note 93], page 29.

[141] FRANCES FOX, JR., "A Description of an Improved Cupping Glass, with Which from Five to Eight Ounces of Blood May Be Drawn, with Observations," *The Lancet,* volume 12 (1827), pages 238–239. KNOX, op. cit. [note 2], pages 36–37, recommended these glasses especially for use on young ladies who feared scars left by cupping. One of the "glass leeches" fixed below the level of the gown could draw all the blood necessary.

[142] See JOHN GORDON, "Remarks on the Present Practice of Cupping; With an Account of an Improved Cupping Glass," *The London Medical Repository,* volume 13 (1820), pages 286–289. J. WELSH, "Description of a Substitute for Leeches," *The Edinburgh Medical and Surgical Journal,* volume 11 (1815), pages 193–194; P. MOLONEY, "A New Cupping Instrument," *Australia Medical Journal,* new series, volume 1 (1879), pages 338–340. At least two American patents were given for improved cups, one to C. L. Myers in 1884 (U.S. patent 291388) and one to Jaime Catuela in 1922 (U.S. patent 1463458).

[143] SAVIGNY, op. cit. [note 106], plate 18, illustrated in 1798 "elastic bottles" that could be attached to glass cups for drawing the breasts; however, not until Charles Goodyear's discovery of the vulcanization process in 1838 was rubber widely used in cupping. An American surgeon, Samuel Gross, wrote in 1866 that the glass cup with a bulb of vulcanized rubber was the "most elegant and convenient cup, by far." See SAMUEL GROSS, *A System of Surgery,* 4th edition, 2 volumes (Philadelphia, 1866), volume 1, page 451.

[144] GEORGE TIEMANN & CO., *American Armamentarium Chirurgicum* (New York, 1889), page 825.

[145] For one listing of the disadvantages of the common scarificator, see BLATIN, "Scarificator nouveau," *Bulletin de l'Académie Royale de Medècine,* volume 11 (1845–1846), pages 87–90. Blatin patented a new scarificator in 1844 that supposedly overcame the difficulties he listed.

[146] JAMES COXETER, "New Surgical Instruments," *The Lancet* (November 15, 1845), page 538; JAMES COXETER & SON, *A Catalogue of Surgical Instruments* (London, 1870), page 48. Coxeter sold his scarificator for 2 pounds, 2 shillings, while he offered his "best scarificator, with old action" for two pounds.

[147] GREAT BRITAIN PATENT OFFICE, *Subject-Matter Index of Patents of Invention, 1617–1852,* 2 volumes (London, 1957); U.S. PATENT OFFICE, *Subject Matter Index of Patents for*

Invention (Brevets d'invention) Granted in France from 1791 to 1876 Inclusive (Washington, 1883).

[148] CHARRIÈRE [firm], *Cinq notices réunies presentées a MM. les membres des jurys des expositions françaises de 1834, 1839, 1844, et 1849, et de l'exposition universelle de Londres en 1851* (Paris, 1851), page 56.

[149] MAISON CHARRIÈRE, ROBERT ET COLLIN, SUCCESSEURS, [Catalogue générale] (Paris, 1867), pages 42, 44, and plate 9.

[150] Patent specifications, U.S. patent 4705; TIEMANN & Co., op. cit. [note 144], page 115. Tiemann was awarded an earlier patent for a scarificator in 1834 (unnumbered U.S. patent, 26 August 1834), which seems to have employed a coiled spring similar to that found in the Charrière scarificator. The fifth U.S. patent for a scarificator was issued in 1846 to A. F. Ahrens of Philadelphia (U.S. patent 4717) for a circular scarificator in which all the blades were attached to a movable plate.

[151] Patent specifications, U.S. patent 5111.

[152] Patent specifications, U.S. patent 8095.

[153] DYCE DUCKWORTH, "On the Employment of Dry-Cupping," *The Practitioner: A Monthly Journal of Therapeutics,* volume 2 (1869), page 153.

[154] Ibid., page 155. For more information on counter-irritation, see BROCKBANK, op. cit. [note 88] Blisters were substances (including mustard and cantharides) that when applied to the skin, occasioned a serous secretion and the raising of the epidermis to form a vesicle. Cautery was the application of a red-hot iron to the skin. A seton was a long strip of linen or cotton thread passed through the skin by a seton needle. Each day a fresh piece of thread was drawn through the sore. Moxa were cones of cotton wool or other substances which were placed upon the skin and burned.

[155] CHARLES BAUNSCHEIDT, *Baunscheidtismus, by the Inventor of the New Curing Method,* 1st English edition, translated from the 6th German edition by John Cheyne and L. Hayman (Bonn., 1859?).

[156] The patent models are in the Smithsonian collection. See "Catalog" herein. The Aima Tomaton, a device invented and manufactured by Dr. L. M'Kay, was yet another American variation on the *Lebenswecker.* See L. M'KAY, *Aima Tomaton: Or New Cupping and Puncturing Apparatus* (Rochester, 1870). An example can be found in the collection of the Armed Forces Institute of Pathology.

[157] See DUCKWORTH, op. cit. [note 153]; ISAAC HOOVER, "An Essay on Dry Cupping," *Transactions of the Belmont Medical Society for 1847–48–49–50* (Bridgeport, 1851), pages 30–32; MARSHALL HALL, *Practical Observations and Suggestions in Medicine* (London, 1845), pages 51–53; and B. H. WASHINGTON, "Remarks on Dry Cupping," *The New Jersey Medical Reporter and Transactions of the New Jersey Medical Society* (1852–53), pages 278–281.

[158] CASPER WISTAR PENNOCK, "Observations and Experiments on the Efficacy and Modus Operandi of Cupping-Glasses in Preventing and Arresting the Effects of Poisoned Wounds," *The American Journal of Medical Sciences,* volume 2 (1828), pages 9–26. For a discussion of the debate over absorption, see KNOX, op. cit. [note 2], pages 21–24.

[159] TIEMANN, op. cit. [note 144], pages 116, 800.

[160] VICTOR-THÉODORE JUNOD, *A Theoretical and Practical Treatise on Hemospasia,* translated by Mrs. E. Howley Palmer (London, 1879).

[161] HEINRICH STERN, *Theory and Practice of Bloodletting* (New York: Rebman Co., 1915), pages 71–72.

[162] AUGUST BIER, *Hyperemia as a Therapeutic Agent* (Chicago, 1905), page 21.

[163] WILLY MEYER and VICTOR SCHMIEDEN, *Bier's Hyperemic Treatment,* 2nd edition (Philadelphia, 1909).

[164] HALLER, op. cit. [note 88; see also note 72], page 585.

[165] GROSS, op. cit. [note 143], volume 2, page 906.

[166] Such a breast pump was illustrated by HEISTER (1719), op. cit. [note 17], plate 14. All glass breast pumps were probably more typical of the eighteenth than the nineteenth century. In the nineteenth century the glass tube was replaced by a flexible tube with a mouthpiece.

[167] For example, see THE J. DURBIN SURGICAL SUPPLY CO., *Standard Surgical Instruments* (Denver, 1929), page 59.

[168] Data on the numbers of breast pumps patented was obtained from the files of the U.S. Patent Office in Arlington, Virginia.

[169] Patent specifications, U.S. patent 1179129. For other illustrations of late nineteenth- and early twentieth-century patents for cupping devices, see HALLER, op. cit. [note 88].

[170] STERN, op. cit. [note 85], page 74.

[171] MABELLE S. WELSH, "'Cups for Colds': The Barber, the Surgeon and the Nurse," *The American Journal of Nursing,* volume 19 (1918–19), pages 763–766. See also HALLER, op. cit. [note 88], and J. EPSTEIN, "The Therapeutic Value of Cupping: Its Use and Abuse," *New York Medical Journal,* volume 112 (1920), pages 584–585.

[172] THORNDIKE, op. cit. [note 3], page 477. For bibliography on leeching, see BROCKBANK, op. cit. [note 88]; MERAT, "Sangsue," *Dictionnaire des sciences médicales,* volume 49 (1820), pages 520–541; G. CARLET AND EMILE BERTIN, "Sangsue," *Dictionnaire encyclopédique des sciences médicales,* 3rd series, volume 6 (1878), pages 660–681; and the *Index Catalogue of the Library of the Surgeon-General's Office,* U. S. Army.

[173] ALFRED STILLE AND JOHN M. MAISCH, *The National Dispensatory,* 2nd edition (Philadelphia, 1880), page 713; JAMES THACHER, *The American Dispensatory,* 2nd edition (Boston, 1813), page 230; C. LEWIS DIEHL, "Report on the Progress of Pharmacy," *Proceedings of the American Pharmaceutical Association,* volume 25 (1876), page 205.

[174] W. H. SCHIEFFELIN & CO., *General Prices Current* (New York, 1887), page 39.

[175] DIEHL, op. cit. [note 173]; JOHN C. HARTNETT, "The Care and Use of Medicinal Leeches in 19th Century Pharmacy and Therapeutics," *Pharmacy in History,* volume 14 (1972), page 133.

[176] Broussais offered the following explanation for the effectiveness of leeching. Congestion of blood vessels in a healthy person gives rise to a sympathetic irritation in the mucous surfaces of bodily orifices. Equilibrium may be restored naturally by hemorrhage through the nose. Without this release of blood, congestion builds up into an inflammation. Local bloodletting relieves the congestion when applied on a portion of the skin corresponding to the inflamed organ. Broussais's favorite remedy was the application of leeches to the stomach and head. For this purpose he ordered hundreds

of leeches daily. See F.J.V. BROUSSAIS, *A Treatise on Physiology Applied & Pathology,* translated by John Bell and R. La Roche, 2nd American edition (Philadelphia, 1828), page 414, and Castiglioni, op. cit. [note 40], page 609.

[177] THORNDIKE, op. cit. [note 3], page 477. See also KARL-OTTO KUPPE, *Die Blutegel in der Aerztlichen Praxis* (reprint, Stuttgart: Hippocrates-Verlag, 1955), pages 9–11.

[178] HARTNETT, op. cit. [note 175], page 132.

[179] JONATHAN OSBORNE, "Observations on Local Blood-letting, and on Some New Methods of Practicing It," *Dublin Journal of Medical and Chemical Science,* volume 3 (1833), pages 334–342.

[180] See, for example, MAISON CHARRIÈRE, ROBERT ET COLLIN, op. cit. [note 149], page 42 and plate 9.

[181] JOHN BERRY HAYCRAFT, "On the Coagulation of the Blood," 9 pages, extracted from *Proceedings of the Royal Society of London,* volume 231 (1884).

[182] THORNDIKE, op. cit. [note 3], page 477. MERAT, op. cit. [note 172], page 528, cited an extreme case in which a woman suffering from peritonitis was given a total of 250 leeches in 24 hours. She died soon after.

[183] STILLE AND MAISCH, op. cit. [note 173], page 715; THACHER, op. cit. [note 173], page 231.

[184] HARTNETT, op. cit. [note 175], page 132; J. K. CRELLIN, op. cit. [note 33], pages 127–134.

[185] ANDREW H. SMITH, "An Artificial Leech," *Medical Record,* volume 4 (1869–70), page 406.

[186] In addition to the references below, articles on artificial leeches include DR. MONTAIN, "Considérations thérapeutiques sur l'emploi du pneumo-derme, nouvel instrument destiné à remplacer les sangsues et les ventouses," *Bulletin Général de thérapeutique,* volume 11 (1836), pages 311–315; J. J. TWEED, "A Description of the Apparatus for Employing the Mechanical Leeches," *Medical Times,* volume 21 (1850), pages 36–37; and SAMUEL THEOBALD, "An Improved Method of Applying the Artificial Leech," *American Journal of Medical Science,* new series, volume 70 (1875), pages 139–142.

[187] SARLANDIÈRE, "Ventouse," *Dictionnaire des sciences médicales,* volume 57 (Paris, 1821), pages 174–178; PAULET, "Bdellometre," *Dictionnaire encyclopédique des sciences médicales,* series 1, volume 8 (Paris, 1868), pages 632–633; L. GRESELY, "Dissertation sur les sangsues, le nouveau scarificateur, et sur leur emploi en médecine" (Paris: Faculty of Medicine, 1820), dissertation no. 202.

[188] ROBLEY DUNGLISON, *Medical Lexicon: A New Dictionary of Medical Science,* 3rd edition (Philadelphia, 1842). The bdellometer was listed in later editions of this dictionary throughout the nineteenth century.

[189] DAMOISEAU, *La terabdelle ou machine pneumatique operant a volonté la saignée locale et la revulsion aux principales regions du corps humains* (Paris, 1862), 60 pages. See also GAUJOT and SPILLMAN, op. cit. [note 49], pages 194–195.

[190] L. WECKER, "De la sangsue artificielle (modéle du baron Heurteloup), et de son emploi dans le traitment des maladies des yeux." *Bulletin général de thérapeutique médicale et chirurgicale,* volume 62 (1862), pages 107–116. For price information, see CASWELL, HAZARD & Co. (W. F. Ford), *Illustrated Catalogue of Surgical Instruments and Appliances* (New York, 1874), page 18. An example of Heurteloup's leech as well as a larger, modified Heurteloup's leech can be found in the collection of the Armed Forces Institute of Pathology.

[191] SMITH, op. cit. [note 185], page 406; TIEMANN, op. cit. [note 144], page 116; Patent specifications, U.S. patent 100210. An example of this artificial leech can be found in the collection of the Armed Forces Institute of Pathology.

[192] TIEMANN, op. cit. [note 144], page 506.

[193] WILLIAM REESE, "Uterine Leech and Aspirator," *Medical Record,* volume 11 (1876), page 596.

[194] OTTO RAUBENHEIMER, "Leeches—How to Dispense Them," *Journal of the American Pharmaceutical Association,* volume 12 (1923), page 339. THORNDIKE, op. cit. [note 3], page 477, notes that in 1927, leeches still could be had in Boston for 75¢ apiece. In Cleveland they were still obtainable in the 1950s.

[195] *Dictionnaire usuel de chirurgie et de médicine vetérinaire,* 2 volumes (Paris, 1835–36), articles "Ventouses" and "Sangsues."

[196] Ibid., article "Saignée."

[197] *Encyclopédie méthodique: Médecine,* volume 9 (Paris, 1816), page 478.

[198] *Dictionnaire usuel,* op. cit. [note 195], volume 2, page 605.

[199] WEISS, op. cit. [note 118], page 100, plate 27.

[200] Patent specifications, U.S. patent 6240.

[201] Patent specifications, U.S. patent 236084.

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FIGURES 26-124

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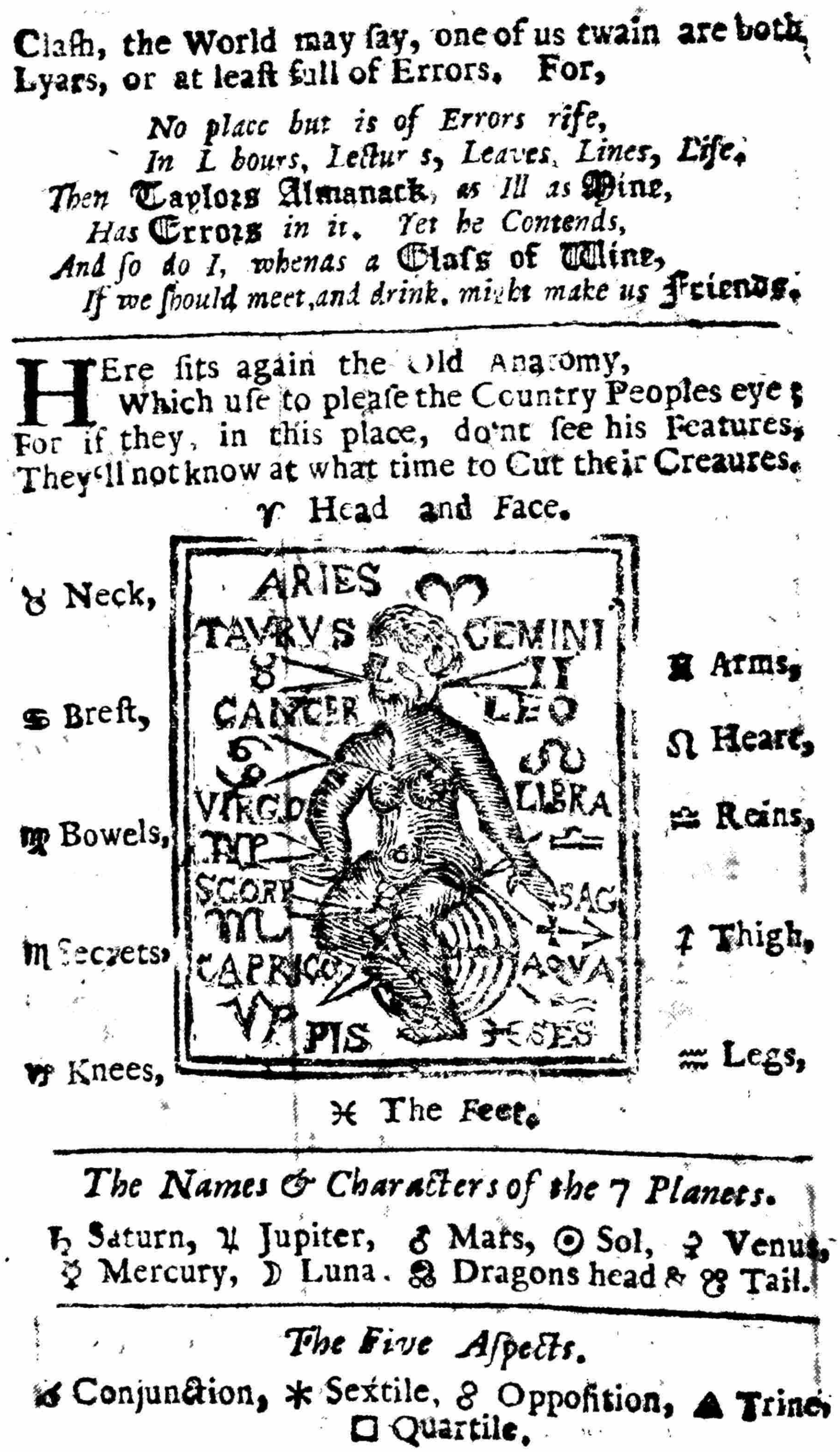


Claſh, the World may ſay, one of us twain are both
Lyars, or at leaſt full of Errors. For,

No place but is of Errors rife,
In L bours, Lectur s, Leaves, Lines, Life,
Then Taylors Almanack, *as Ill as* Mine,
Has Errors *in it. Yet he Contends,*
And ſo do I, whenas a Glaſs of Wine,
If we ſhould meet, and drink, might make us Friends.

HEre ſits again the Old Anatomy,
Which uſe to pleaſe the Country Peoples eye ;
For if they, in this place, do'nt ſee his Features,
They'll not know at what time to Cut their Creaures.

♈ Head and *Face*.

♉ Neck, ♋ Breſt, ♍ Bowels, ♏ Secrets, ♑ Knees,

♊ Arms, ♌ Heart, ♎ Reins, ♐ Thigh, ♒ Legs,

♓ The *Feet*.

The Names & Characters of the 7 Planets.

♄ Saturn, ♃ Jupiter, ♂ Mars, ☉ Sol, ♀ Venus,
☿ Mercury, ☽ Luna. ☊ Dragons head & ☋ Tail.

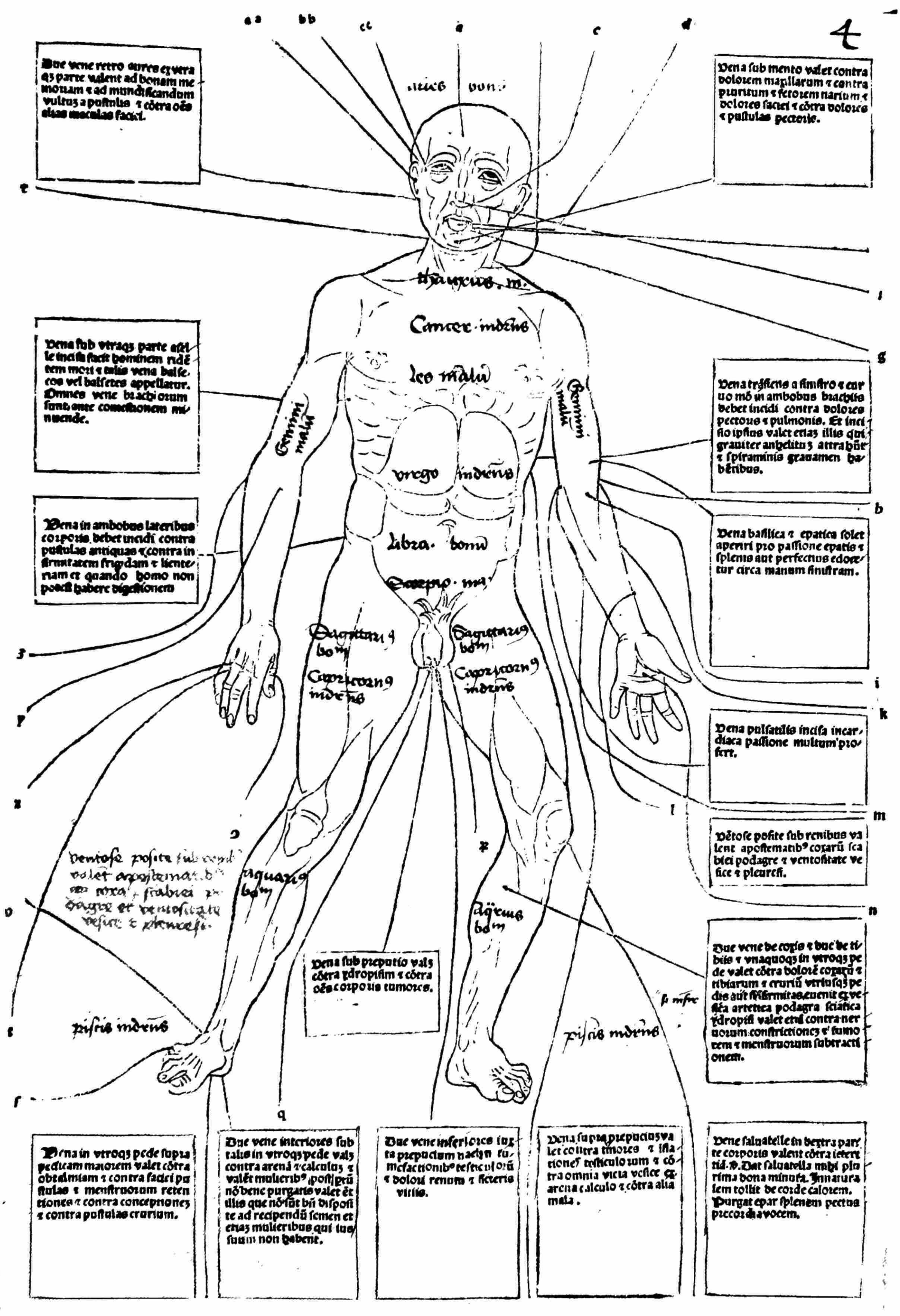
The Five Aſpects.

☌ Conjunction, ⚹ Sextile, ☍ Oppoſition, △ Trine,
□ Quartile.

FIGURE 26.—Reproduction of a Greek vase showing a 5th century B.C. medical "clinic." Original is in the Louvre. Patient is about to undergo venesection in the arm. Bronze bleeding bowl catches the blood. (NMHT 233055 [M-9618]; SI photo 73-4216.)

FIGURE 27.—Bloodletting man from a New York almanac, 1710. (From Daniel Leeds, *The American Almanack for the Year of Christian Account, 1710.* Photo courtesy of the Library of Congress.)

FIGURE 28.—Phlebotomy manikin in Johannes de Ketham *Fascicules Medicinae.* Venice, 1495. (From the Dibner Library of the History of Science and Technology, NMHT.)


aa
bb
cc
a
c
d
t
Due vene retro aures ex vtraqz parte valent ad bonam memoriam et ad mundificandum vultuz a pustulis et cōtra oēs alias maculas faciei.
Vena sub mento valet contra dolorem maxillarum et contra pruritum et fetorem narium et dolores faciei et cōtra dolores et pustulas pectoris.
e
f
g
Cancer · indiffns
Leo malu
Gemini malu
Virgo indiffns
Libra · bonu
Vena sub vtraqz parte assille incisa facit hominem ridētem mori et talis vena balsecos vel balsetes appellatur. Omnes vene brachiorum sunt ante comestionem minuende.
Vena trāsiens a sinistro et curuo mō in ambobus brachijs debet incidi contra dolores pectoris et pulmonis. Et incisio ipsius valet etiaz illis qui grauiter anhelituz attrahūt et spiraminis grauamen habētibus.
b
Vena in ambobus lateribus corporis debet incidi contra pustulas antiquas et contra infirmitatem frigidam et lienteriam et quando homo non potest habere digestionem
Vena basilica et epatica solet aperiri pro passione epatis et splenis aut perfectius edocetur circa manum sinistram.
Sagittarius bonu
Capricornus indiffns
i
k
Vena pulsatilis incisa incardiaca passione multum proficit.
l
m
Vētose posite sub renibus valent apostematib9 coxarū scabiei podagre et ventositate vesice et pleuresi.
n
Aquarius bonu
Vena sub preputio valz cōtra ydropisim et cōtra oēs corporis tumores.
Pisces indiffns
q
Vena in vtroqz pede supra pedicam maiorem valet cōtra obtalmiam et contra faciei pustulas et menstruorum retentiones et contra conceptiones et contra pustulas crurium.
Due vene interiores sub talis in vtroqz pede valz contra arenā et calculuz et valēt mulierib9 postq̄ prū nō bene purgatis valet ēt illis que nō sūt bñ disposite ad recipendū semen et etiaz mulieribus qui ius suum non habent.
Due vene inferiores iuxta preputium nascūt cū tumefactionib9 testiculorū et dolori renum et ceteris vitiis.
Vena supra preputiuz valet contra tumores et inflationes testiculorum et cōtra omnia vicia vesice et arena calculo et cōtra alia mala.
Vene saluatelle in dextra parte corporis valent cōtra ictericiā. ✠. Dat saluatella mihi plurima bona minuta. Innaturalem tollit de corde calorem. Purgat epar splenem pectus precordia vocem.

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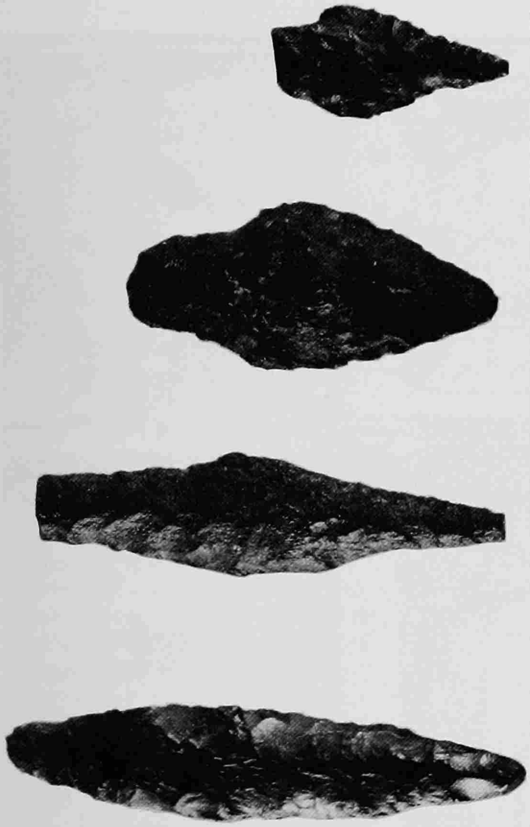

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FIGURE 30.—Flint lancets used by native doctors in Alaska, 1880s. (Anthropology Catalog 127758; SI photo 73–4208).

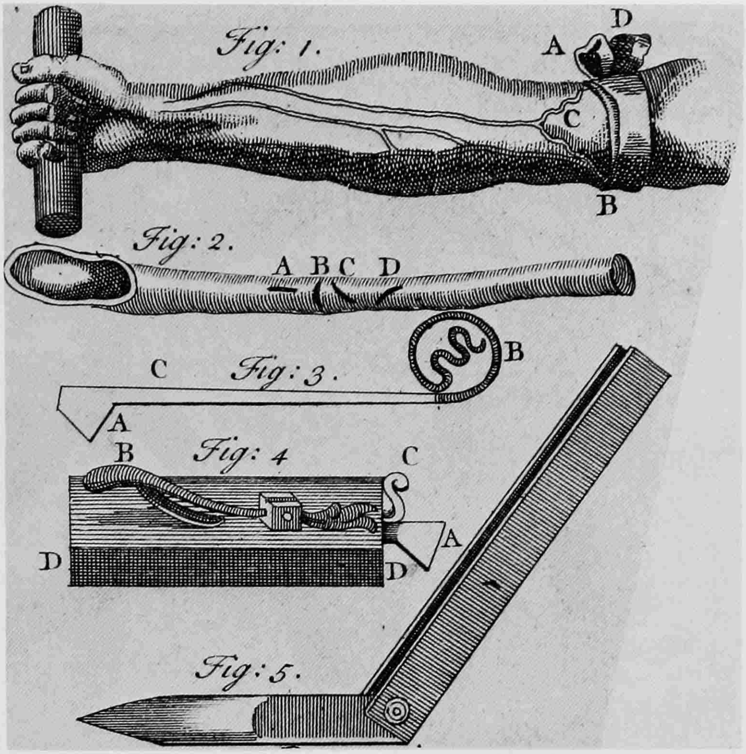

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FIGURE 31.—Instruments and technique of phlebotomy: Fig. 1 shows an arm about to be bled. A ligature has been applied to make the veins swell. The common veins bled—cephalic, basilic, and median—are illustrated. Fig. 2 shows several types of incisions. Fig. 3 is a fleam, Fig. 4 a spring lancet, and Fig. 5 a "French lancet." (From Laurence Heister, *A General System of Surgery*, London, 1759. Photo courtesy of NLM.)

FIGURE 29.—Lionel Wepfer, a 17th century traveler, described the Indian method of bloodletting as follows: "The patient is seated on a stone in the river, and one with a small bow shoots little arrows into the naked body of the patient, up and down, shooting them as fast as he can and not missing any part. But the arrows are guarded, so that they penetrate no farther than we commonly thrust our lancets; and if by chance they hit a vein which is full of wind, and the blood spurts out a little, they will leap and skip about, shewing many antic gestures, by way of rejoicing and triumph." (From Lionel Wepfer, *A New Voyage and Description of the Isthmus of America*, London, 1699. Photo courtesy of NLM.)

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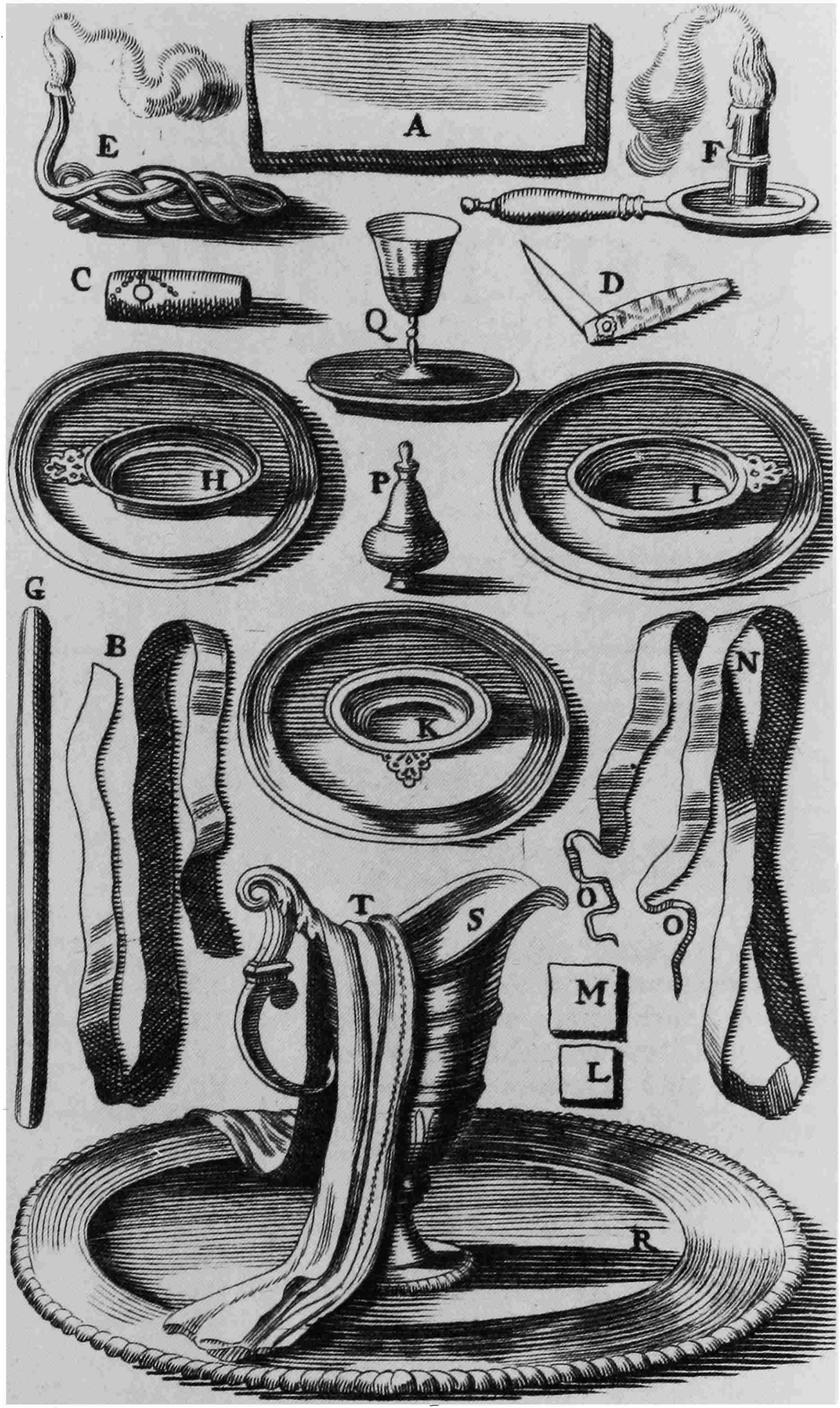
FIGURE 32.—Replica of a barber-surgeon's signboard dated 1623. Top left corner shows a phlebotomy being performed. (NMHT 215690 [M–7343]; SI photo 44681.)

FIGURE 33.—Instruments for bleeding from the arm, 1708: A, a serviette to cover the patient's clothing; B, a cloth ligature to place around the arm; C, a lancet case; D, a lancet; E and F, candles to give light for the operation; G, a baton or staff for the patient to hold; H, I, and K, basins for collecting blood; L and M, compresses; N, a bandage to be placed over the compress; P, *eau de la Reine d'Hongrie* that can be used instead of vinegar to revive the patient if he faints; Q, a glass of urine and water for the patient to drink when he revives; R, S, T, implements for washing the hands and the lancets after the operation. (From Pierre Dionis, *Cours d'opérations de chirurgie demontrées au Jardin Royal,* Paris, 1708. Photo courtesy of NLM.)



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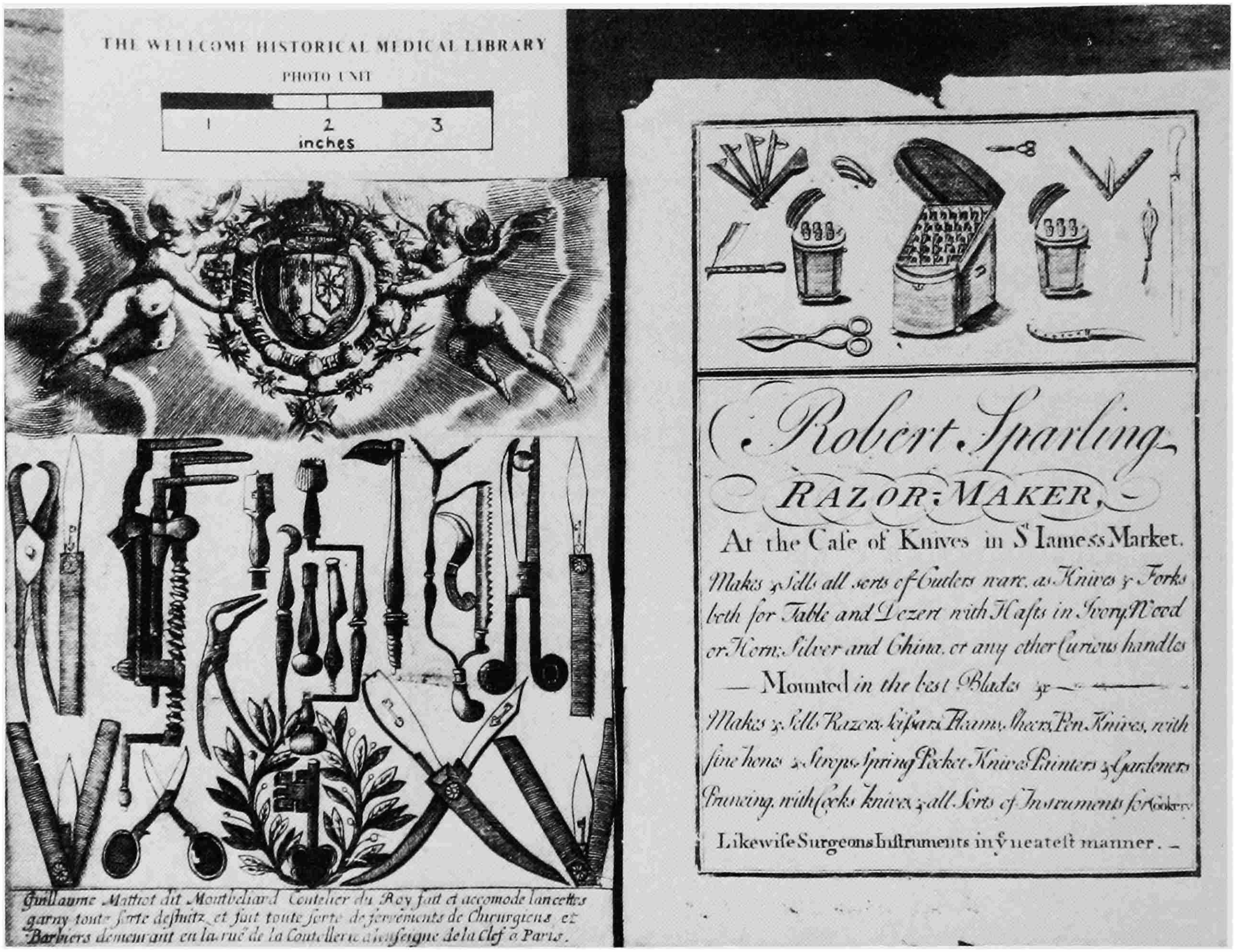

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FIGURE 34.—Two 18th century trade cards advertising lancets. (Photo courtesy of Wellcome Institute, London.)

FIGURE 35.—Lithograph, London, 1804, showing a phlebotomy. (On loan from Armed Forces Institute of Pathology; SI photo 42579.)

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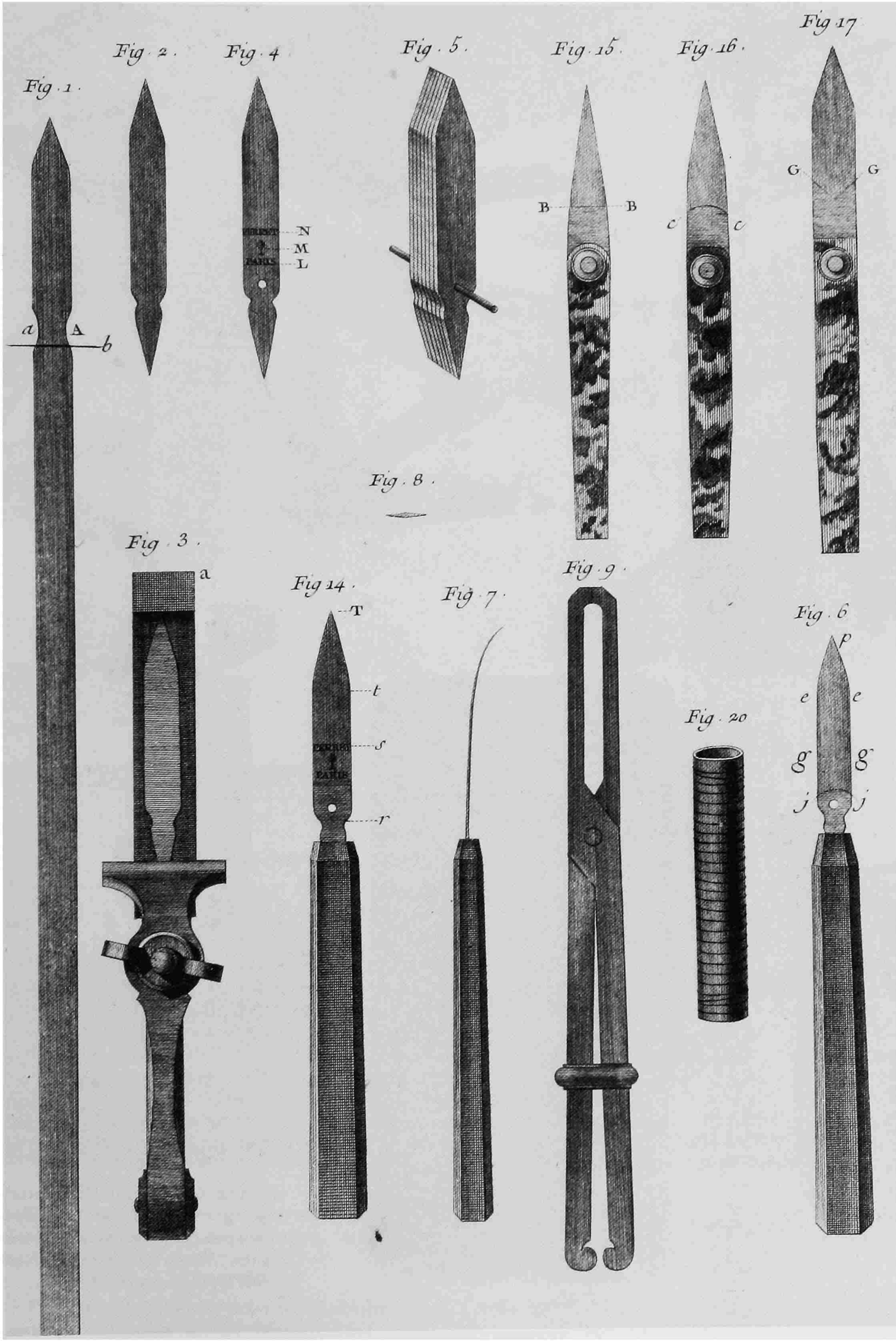

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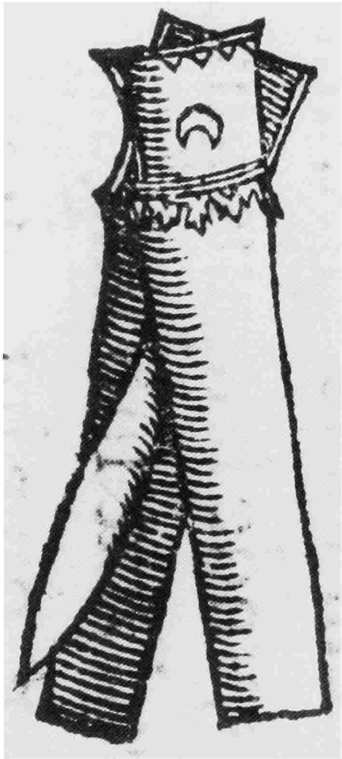
FIGURE 36.—18th-century cutler's illustrations for making lancets. Note the variations in the shape of the lancet blades. (From Jean Jacques Perret, *L'Art du Coutelier*, Paris, 1772. Photo courtesy of NLM.)



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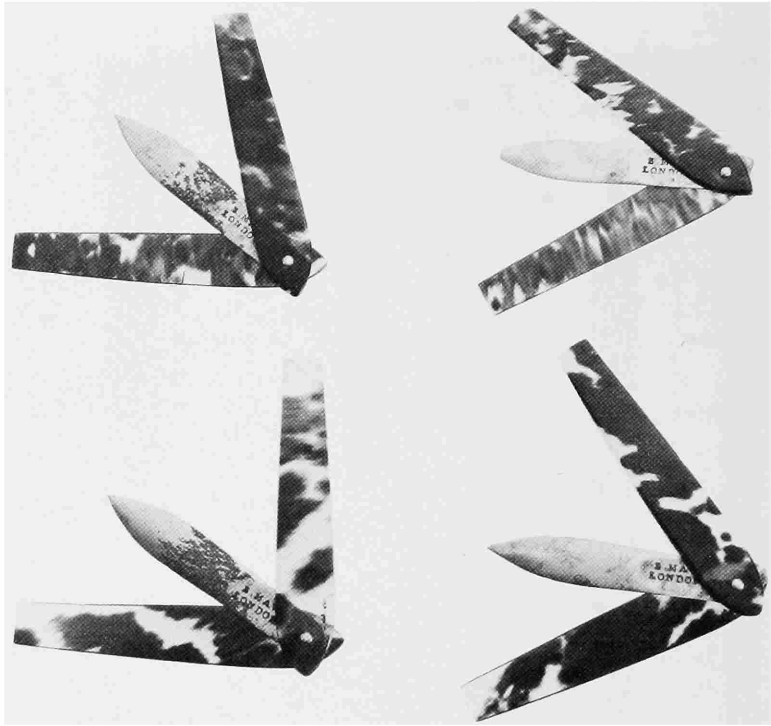

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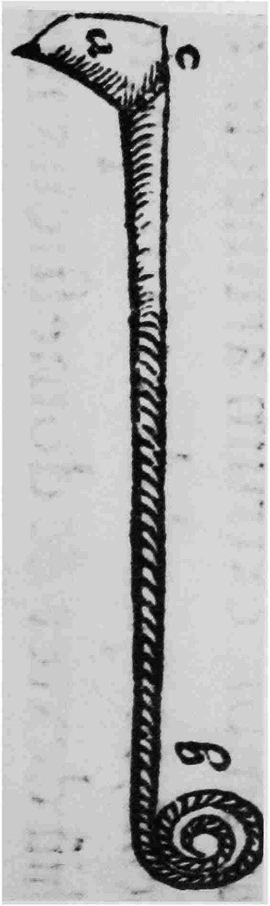
FIGURE 37.—Thumb lancet, 16th century. (From Leonardo Botallo, *De Curatione per Sanguinis Missionem,* Antwerp, 1583. Photo courtesy of NLM.)

FIGURE 38.—Typical 19th-century thumb lancets, engraved "S. Maw, London." (NMHT 139980 [M-4151]; SI photo 73-4230.)

FIGURE 39.—Typical 19th-century brass spring lancet and case. The case is stamped "Traunichtesstícht," which translates, "Watch out, it stabs." (NMHT 308730.10; SI photo 74-4088.)

FIGURE 40.—Spring lancets, dated 1775. (Held by Rhode Island Medical Society; SI photo 73-5762.)



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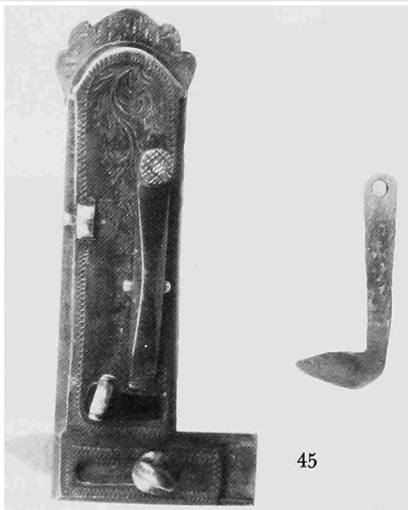

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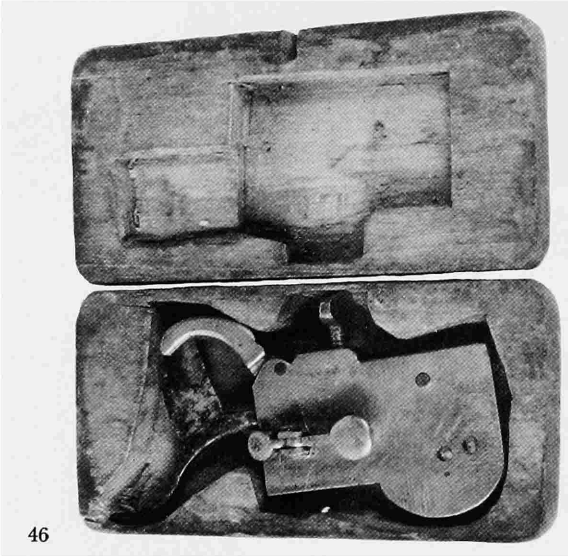
FIGURE 41.—Fleam, 16th century. (From Leonardo Botallo, *De Curatione per Sanguinis Missionem,* Antwerp, 1583. Photo courtesy of NLM.)

FIGURE 42.—Hand-forged fleam with hand-carved wooden case, 17th and 18th century, Swiss or Tyrolean. (NMHT 233570 [M–9666]; SI photo 59139–E.)

FIGURE 43.—Fleam made by E. Dalman, London. Note unusual curved shape to blade. (From the original in the Wellcome Museum by courtesy of the Trustees, photo L. 1346.)

FIGURE 44.—Silver spring lancet in case. Case is lined with white silk and rose plush and has a gold leaf border. (NMHT 321687.02; SI photo 76–7752.)

FIGURE 45.—Unusual spring lancet with extra blade, engraved "M.A. Prizzi," 18th century. (NMHT 320033.06; SI photo 76–7763.)



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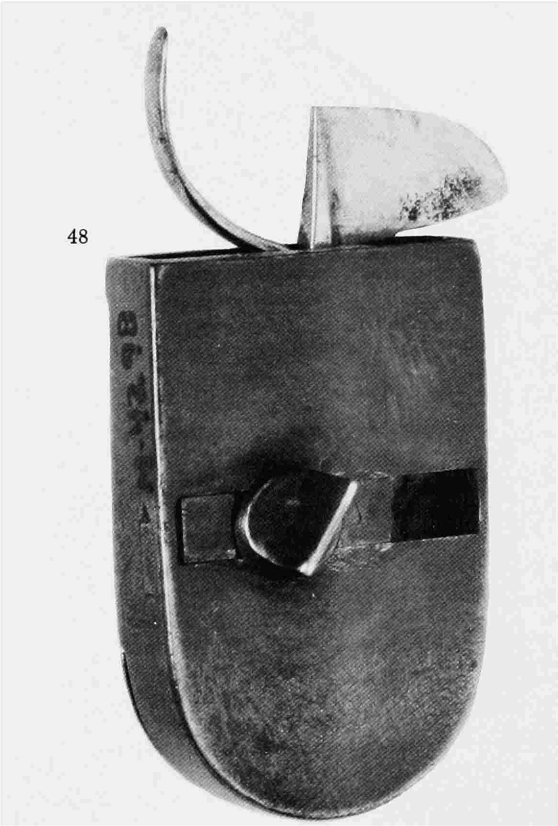

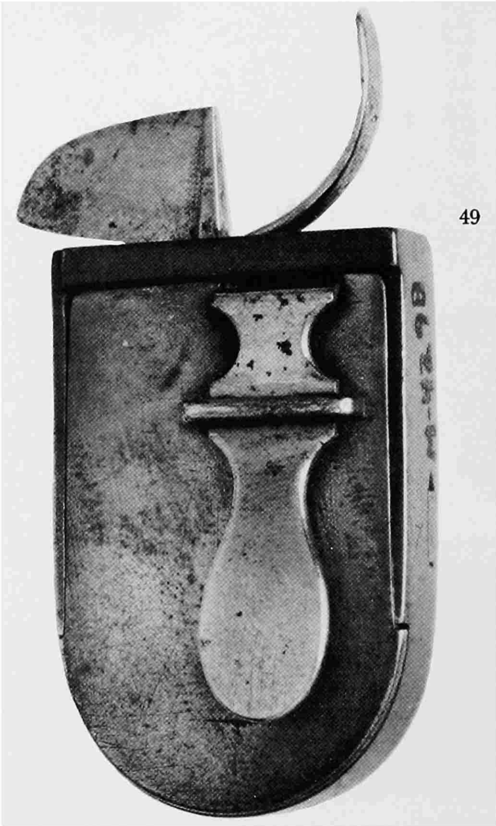

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FIGURE 46.—Unusual spring lancet in hand-carved wooden case, 18th century. Note the large blade and blade guard regulated by a screw. (NMHT 321.697.12; SI photo 76-9114.)

FIGURE 47.—George Tiemann & Co.'s spring lancet, late 19th century. (NMHT 163863 [M-5141]; SI photo 73-5644.)

FIGURE 48.—Patent model spring lancet, patented by J.W.W. Gordon in 1857. Back view. (NMHT 89797 [M-4298]; SI photo 73-10319.)

FIGURE 49.—Patent model spring lancet, patented by J.W.W. Gordon in 1857. Front view. (NMHT 89797 [M-4298]; SI photo 73-10318.)

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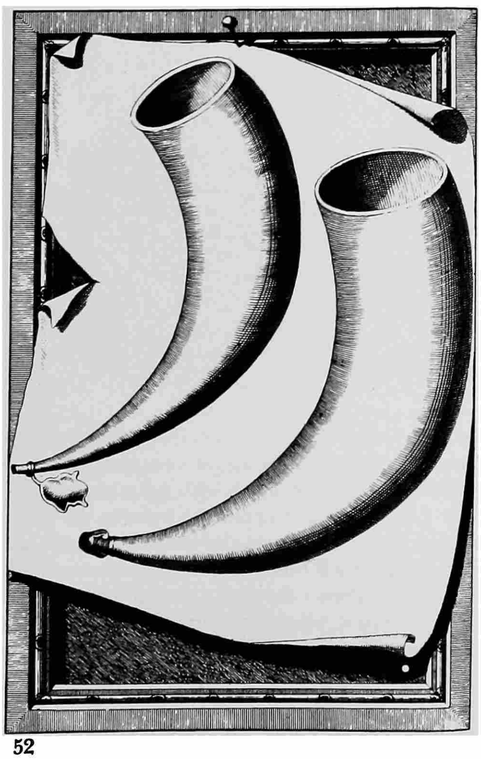

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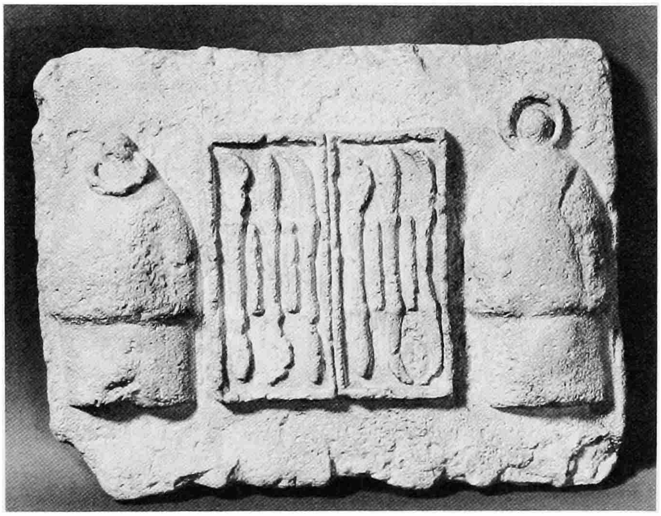
FIGURE 50.—Wet cupping for a headache. (From Frederik Dekkers, *Exercitationes Practicae Circa Medendi Methodum,* Leyden, 1694. Photo courtesy of NLM.)

FIGURE 51.—Dry cupping for sciatica. (From Frederik Dekkers, *Exercitationes Practicae Circa Medendi Methodum,* Leyden, 1694. Photo courtesy of NLM.)

FIGURE 52.—Horn cups used in Egypt in the 16th century. (From Prosper Alphinus, *Medicina Aegyptorum,* Leyden, 1719. Photo courtesy of NLM.)

FIGURE 53.—Horn cup used in the Niger Republic of West Africa in the 1960s. (NMHT 270023 [M-11998]; SI photo 73-5643.)



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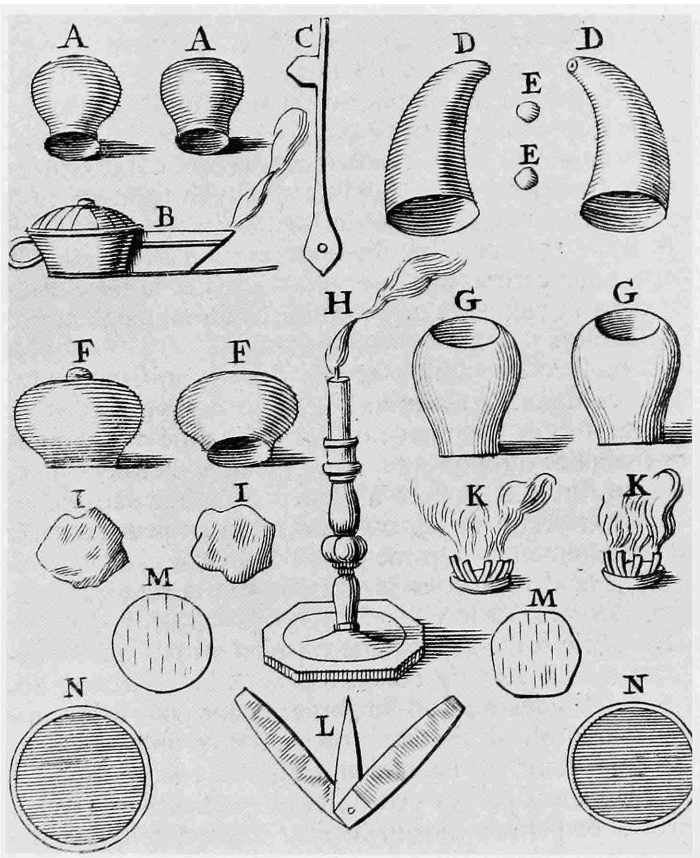

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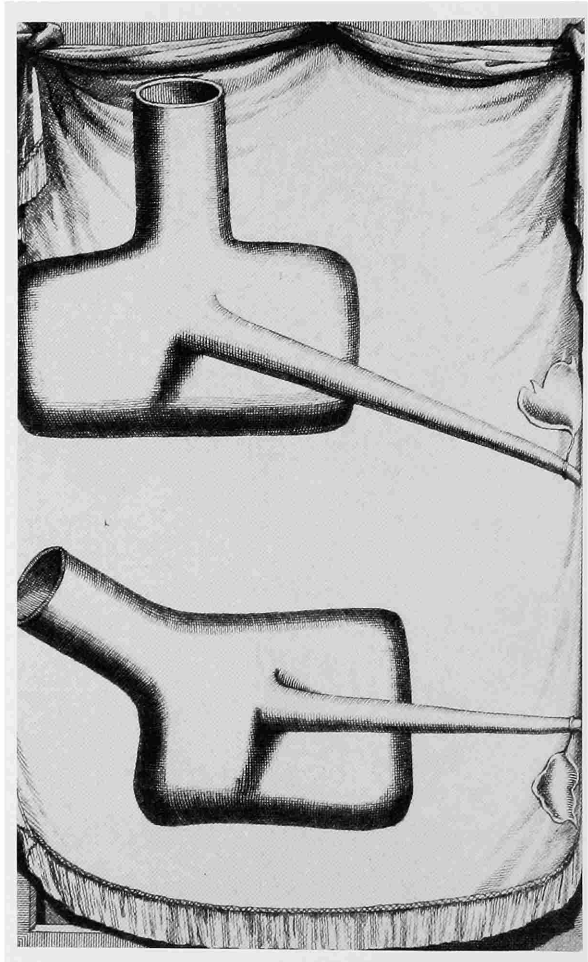
FIGURE 54.—Replica of a Greek votive tablet found in the remains of the Temple of Aesculapius. Pictured are two metal cups and a set of scalpels. (NMHT 233055 [M-9617]; SI photo 73-4217.)

FIGURE 55.—Egyptian spouted cupping cups, 16th century. (From Prosper Alpinus, *Medicina Aegyptorum*, Leyden, 1719. Photo courtesy of NLM.)



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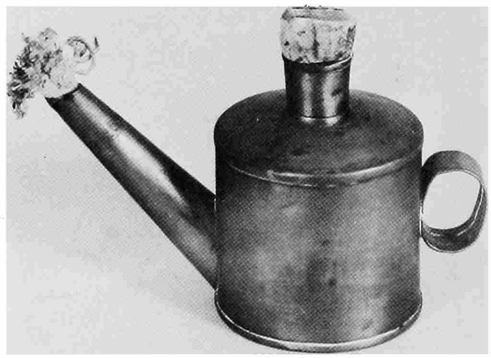

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FIGURE 56.—Cupping instruments illustrated by Dionis, 1708: A, cups made of horn; B, lamp for exhausting air; C, fleam for making scarifications; D, horns with holes at the tip for mouth suction; E, balls of wax to close the holes in the horn cups; F, G, glass cups; H, candle to light the tow or the small candles; I, tow; K, small candles on a card which is placed over the scarifications and lit in order to exhaust the cup; L, lancet for making scarifications; M, scarifications; N, plaster to place on the wound. (From Pierre Dionis, *Cours d'opérations de chirurgie demontrées au Jardin Royal,* Paris, 1708. Photo courtesy of NLM.)

FIGURE 57.—Teapot lamp, 18th century. (NMHT 199536 [M-6691]; SI photo 73-4218.)

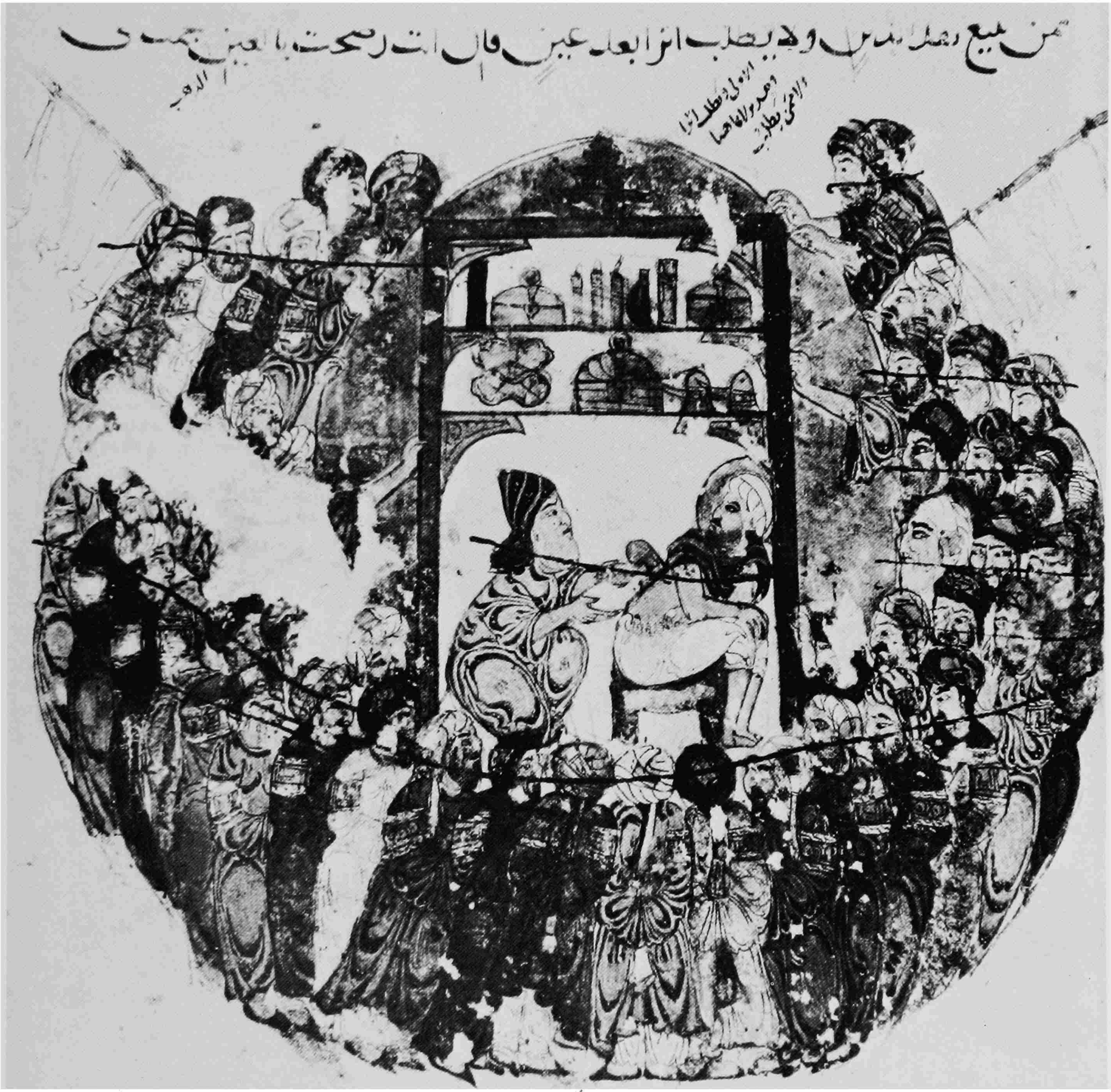

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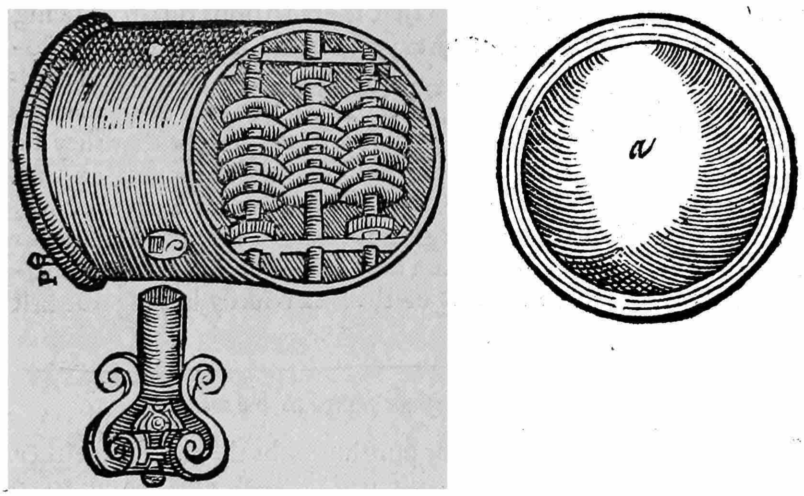
FIGURE 58.—13th-century Arabic cupping scene. (From a manuscript held by the Freer Gallery. SI photo 43757–J.)



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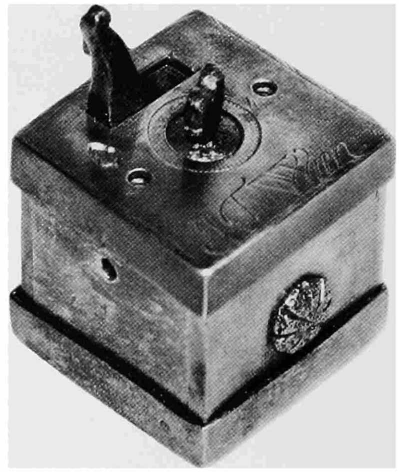

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FIGURE 59.—Paré's scarificator, 16th century. (From *The Workes of that Famous Chirurgeon, Ambrose Parey*, translated by Thomas Johnson, London, 1649. Photo courtesy of NLM.)

FIGURE 60.—Square scarificator, engraved "J.T./Wien," late 18th–early 19th century. Vienna was an early center for the making of scarificators. (NMHT 218383 [M-9257]; SI photo 73-4212.)

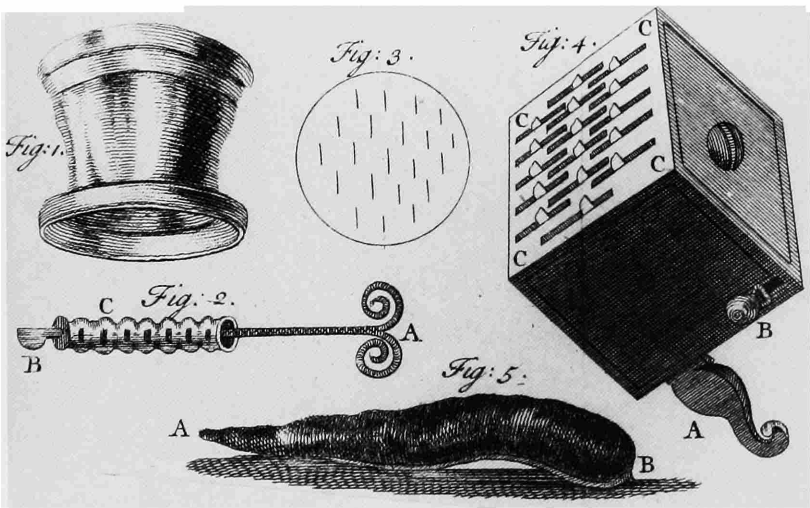

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FIGURE 61.—An early illustration of the scarificator. Also pictured are a fleam for making scarifications, the pattern of scarifications, a metal cup, and a leech. (From Laurence Heister, *A General System of Surgery*, 7th edition, London, 1759. SI photo 73-4182.)

FIGURE 62.—Square scarificator taken apart. (NMHT 152130 [M-4771]; SI photo 76-9113.)

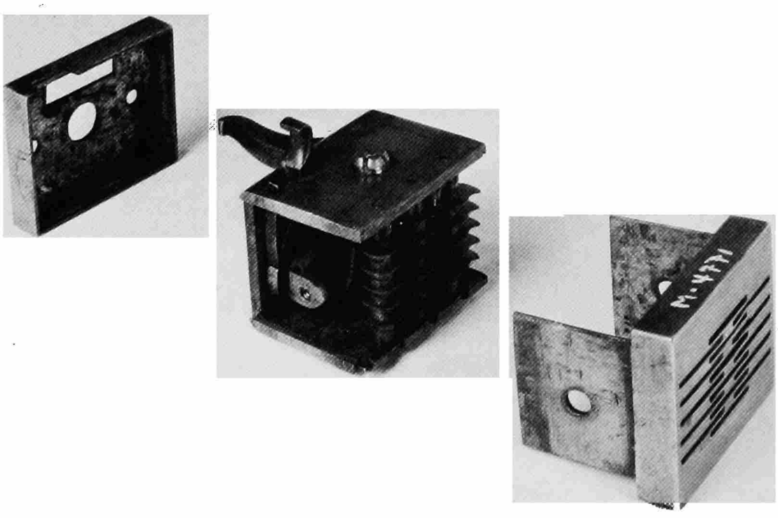

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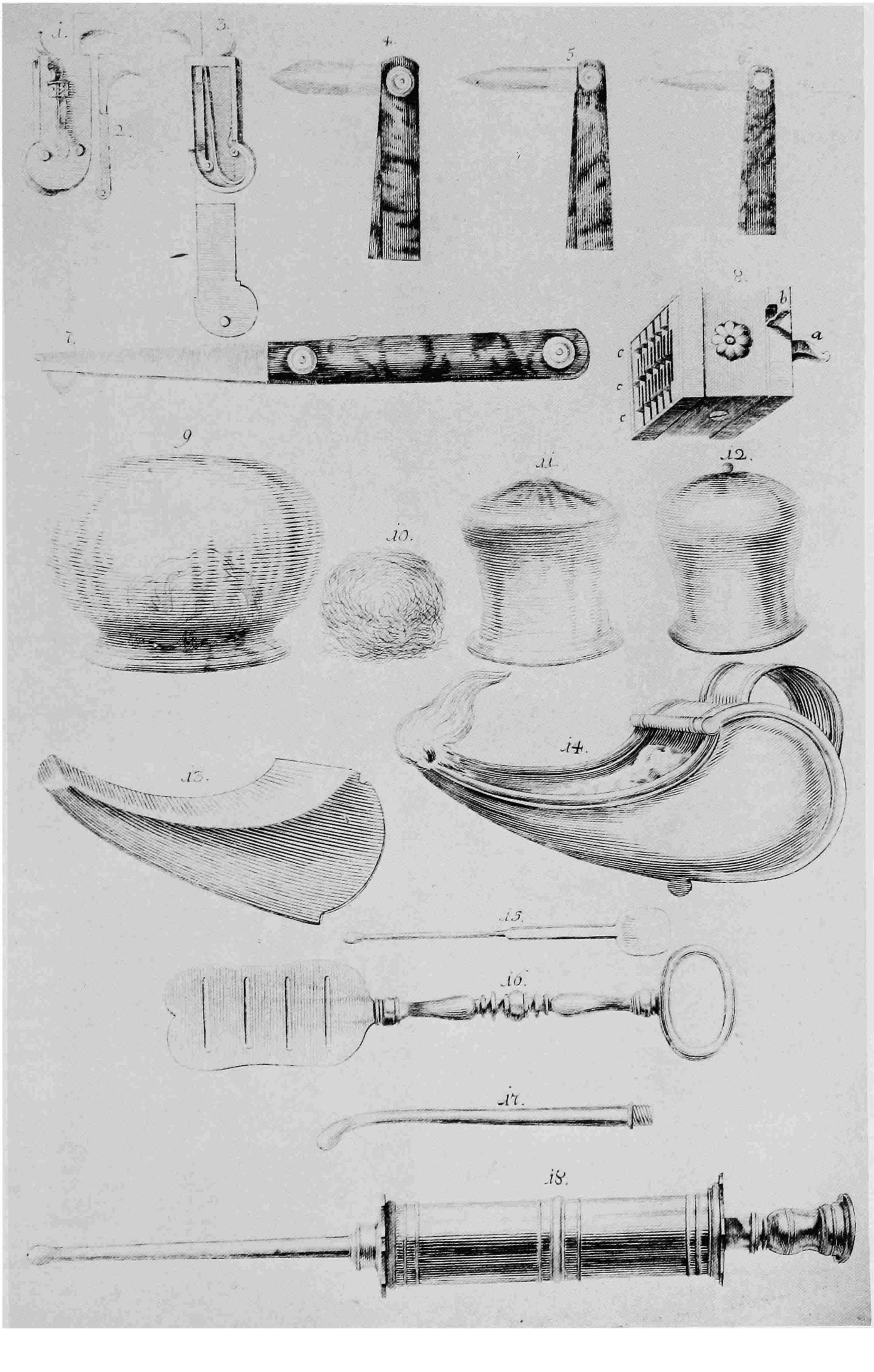
FIGURE 63.—Cupping and bleeding instruments, 1780. Illustrated are spring lancets, thumb lancets, cups, a square scarificator with pointed blades, and a lamp in which animal fat was burned. Figs. 16, 17, and 18 are unrelated to bloodletting. (From J. A. Brambilla, *Instrumentarium Chirurgicum Viennense*, Vienna, 1780. Photo courtesy of NLM.)



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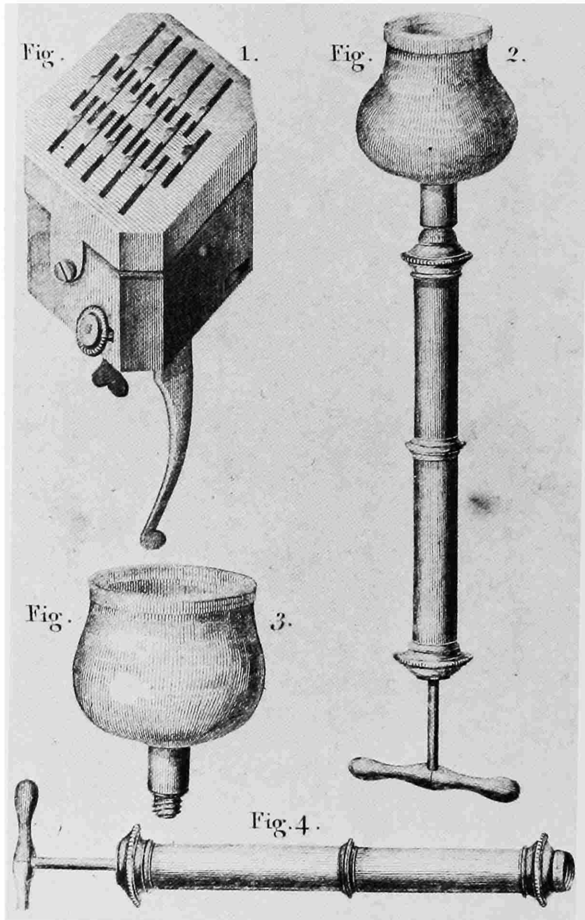

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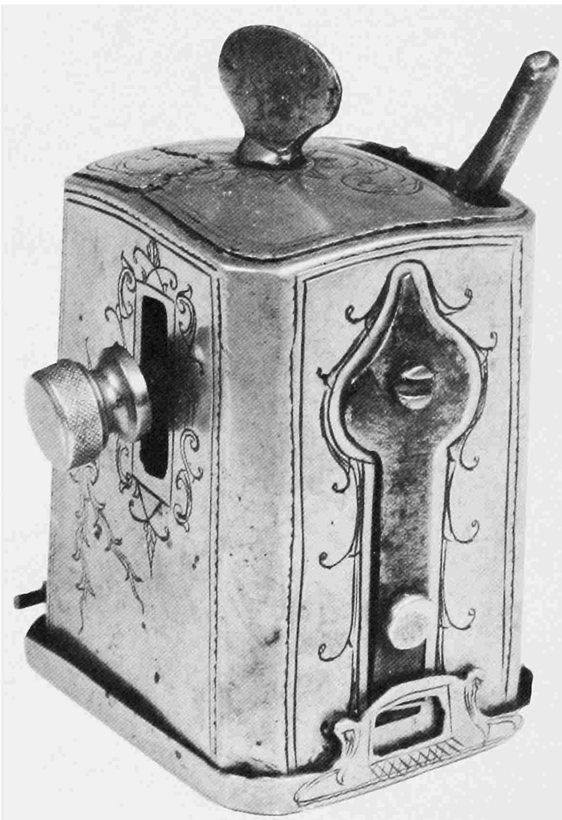

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FIGURE 64.—Set of scarificator blades. Each row of blades may be inserted in place of those in need of cleaning or repair. (From the original in the Wellcome Museum by courtesy of the Trustees. Photo L. 2418.)

FIGURE 65.—An early illustration of the octagonal scarificator, 1801. This plate also includes one of the earliest illustrations of the syringe applied to cupping cups. (From Benjamin Bell, *A System of Surgery*, 7th edition, volume 3, Edinburgh, 1801. SI photo 73-5181.)

FIGURE 66.—An unusual octagonal scarificator made by Domenico Pica in 1793. The blade cover is attached by a hinge, and the turnkey on top raises and lowers the entire interior chassis in order to regulate depth of cut. (NMHT 320033.01; SI photo 76-7742.)

FIGURE 67.—Scarificator marked Dom° Morett, 1813. (From the original in the Wellcome Museum, by courtesy of the Trustees. Wellcome R2909/1936; photo L 1159.)

FIGURE 68.—Cupping set with base handled torch, 8 blade scarificator, 4 blade scarificator for cupping on temples, 2 cups and alcohol bottle. (NMHT, SI photo 76-9119.)

FIGURE 69.—Calling card, ca. 1860. (SI photo.)

PETER GOOD

Does

Cupping and Bleeding

For

Rheumatism, Backache, Bruises, Pain in Side, Pleurisy, Apoplectic Stroke, Etc.

CALL AT OR ADDRESS, ONLY AT NIGHT AND SUNDAYS,

NO. 1404 Cotton St., - - READING, PA.

69

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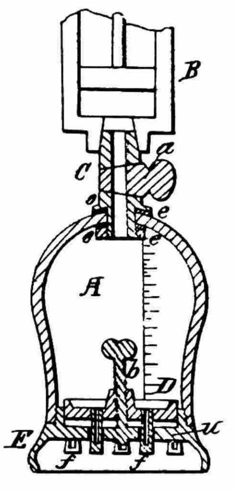
FIGURE 70.—Cupping set manufactured by Charrière of Paris, mid-19th century. Note the tubing used to connect the pump to the cups, and the circular scarificator with blades cutting in opposite directions. (NMHT 302606.007; SI photo 75–090.)

FIGURE 71.—W. D. Hooper's patent cupping apparatus with tubular blades. (From patent specifications, U.S. patent no. 68985. SI photo 73–5193.)

FIGURE 72.—Demours' device for combining cup, scarifier and exhausting apparatus. (From Samuel Bayfield, *A Treatise on Practical Cupping*, London, 1823. Photo courtesy of the NLM.)

FIGURE 73.—R. J. Dodd's patent cupping apparatus. Figs. 4 and 5 are the tubes for cupping the uterus. Fig. 3 is the flexible match scarifier. (From patent specifications, U.S. patent no. 3537. SI photo 73–5192.)



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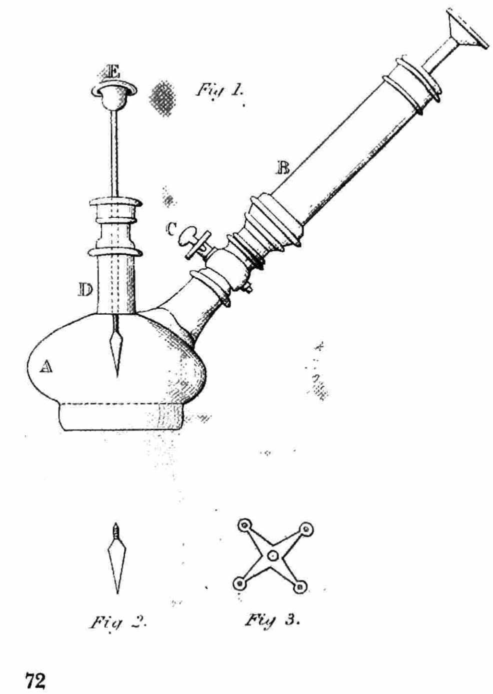

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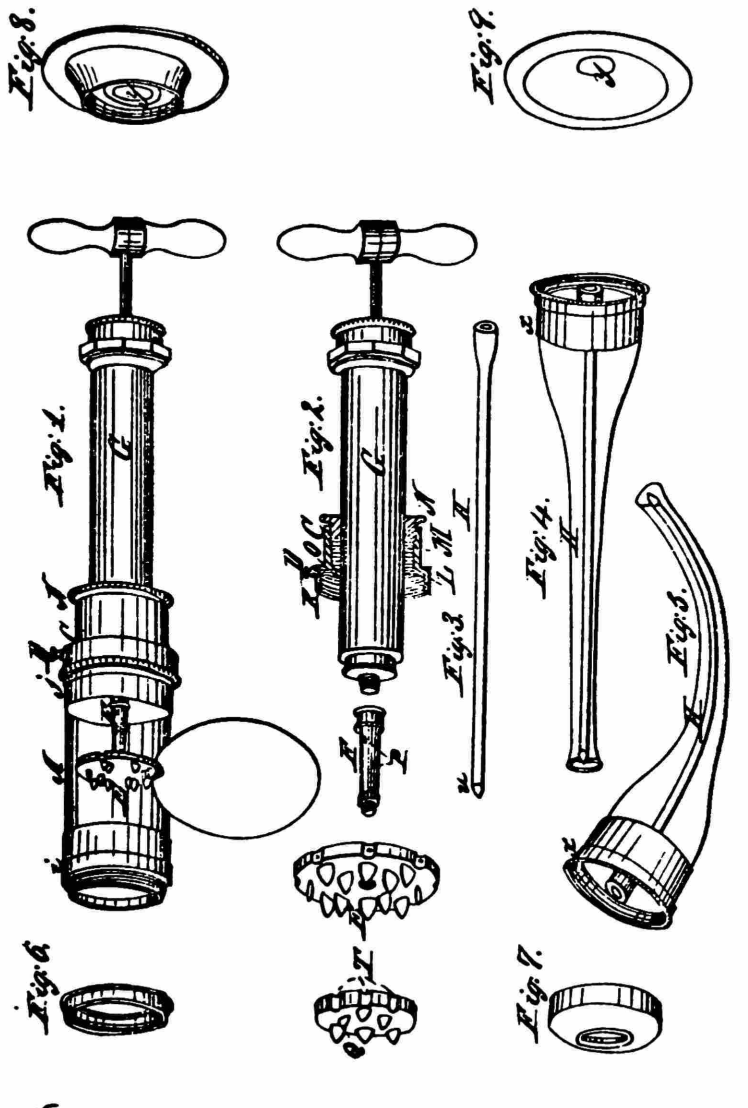
R. J. Dodd,

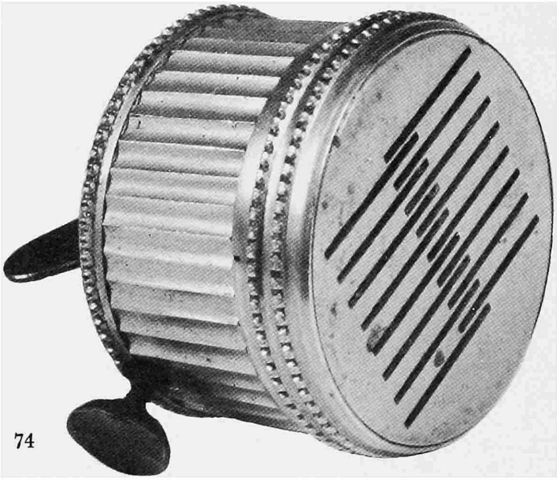
Cupping Apparatus.

Nº 3,537. Patented Apr. 13, 1844



Witnesses:
D. E. Wilson
Saml. Sweetser

Inventor:
R J Dodd,



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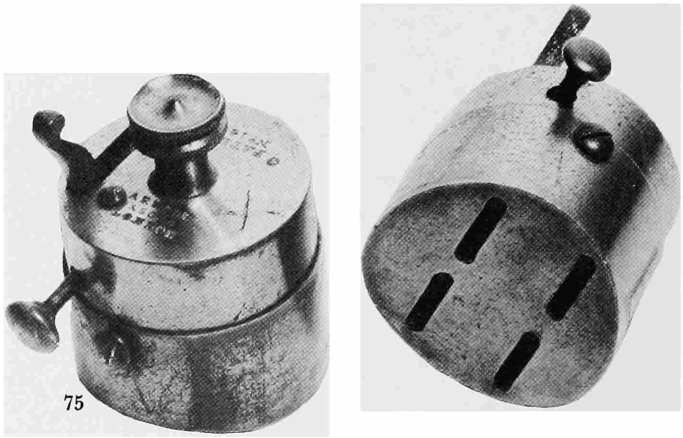

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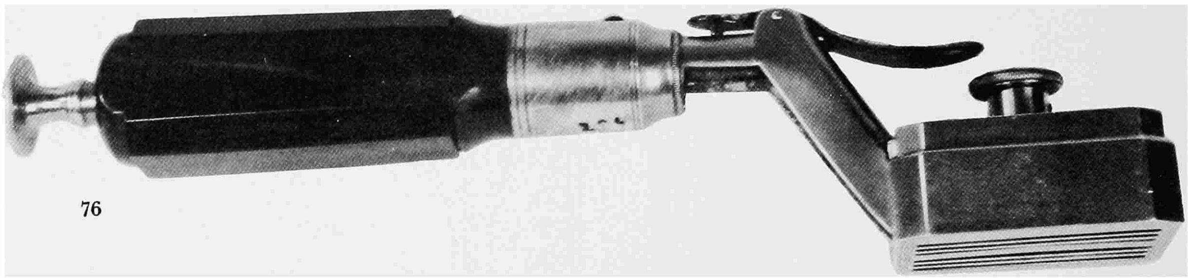

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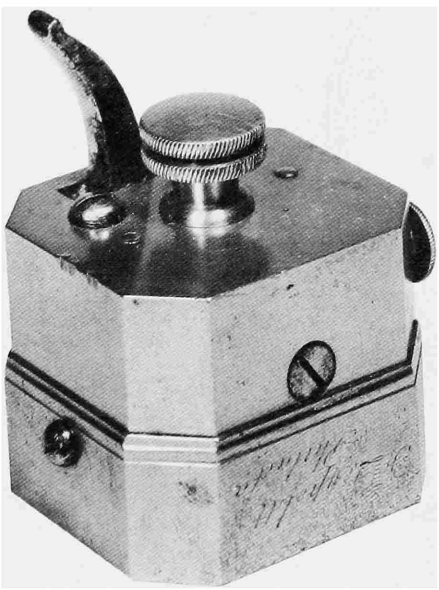

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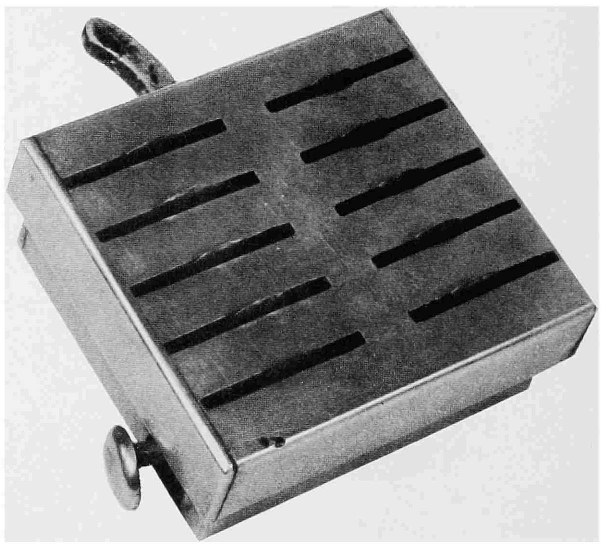

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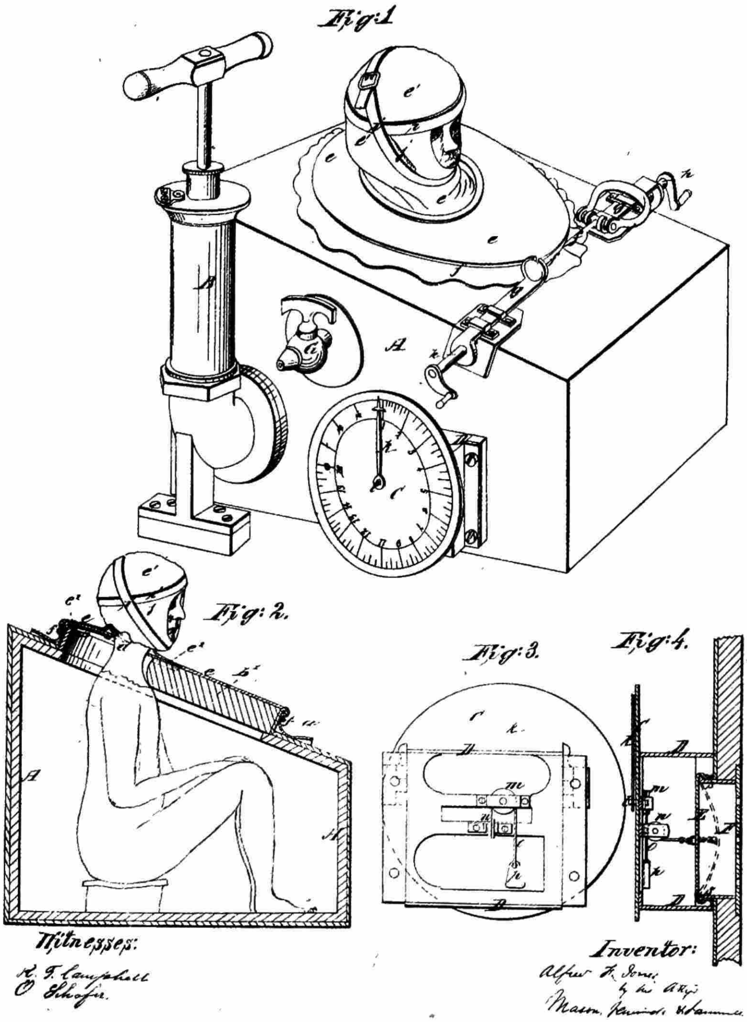

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FIGURE 74.—Circular scarificator. (NMHT 320933.05; SI photo 76–7746.)

FIGURE 75.—Scarificator for vaccination. Mallam's, made by Arnold & Sons, London. Patent 1406. (From the original in the Wellcome Museum by courtesy of the Trustees. Wellcome 13557; photo 125/1960.)

FIGURE 76.—Patent model of Tiemann's scarificator. (NMHT 89797 [M–4289]; SI photo 76–9115.)

FIGURE 77.—Patent model of Leypoldt's scarificator, 1847. (NMHT 89797 [M–4290]; SI photo 73–4213.)

FIGURE 78.—Patent model of Leypoldt's scarificator, 1851. (NMHT 89797 [M–4293]; SI photo 76–9112.)

FIGURE 79.—Baunscheidt's *Lebenswecker,* a counter-irritation device. (NMHT 287885 [M–12936]; SI photo 76–7751.)

FIGURE 80.—Depurator patented by A. F. Jones, 1866. (From patent specifications, reissue 2276. SI photo.)

FIGURE 81.—Junod's boot. (On loan from the Armed Forces Institute of Pathology. SI photo 73–7885.)

FIGURE 82.—Woman cupping her breast. (From Maw, Son & Thompson, *Surgeon's Instruments, etc*, London, 1882. SI photo 76–13540.)

FIGURE 83.—Glass breast pump with spout for self application. (NMHT 260557 [M–11467]; SI photo 76–7759.)

FIGURE 84.—Goodyear's patent breast pump, manufactured by the Union India Rubber Co. (NMHT 252497 [M–10510]; SI photo 76–7762.)

FIGURE 85.—Brier's Hyperemia Apparatus, 1930s. (From Matthay Hospital Supply Co., *Surgical Instruments,* Los Angeles, 1937(?). SI photo.)

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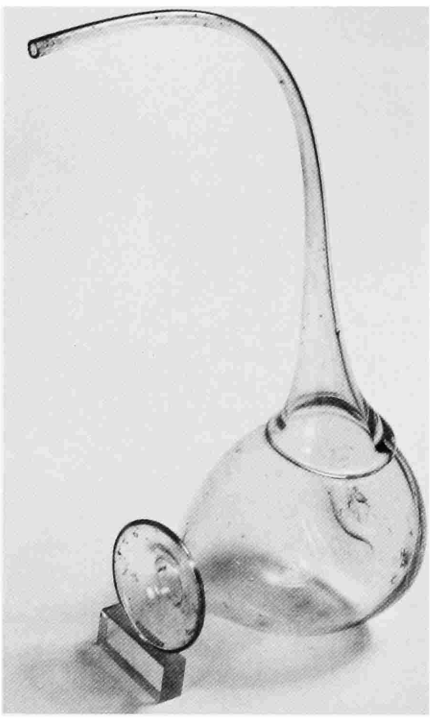

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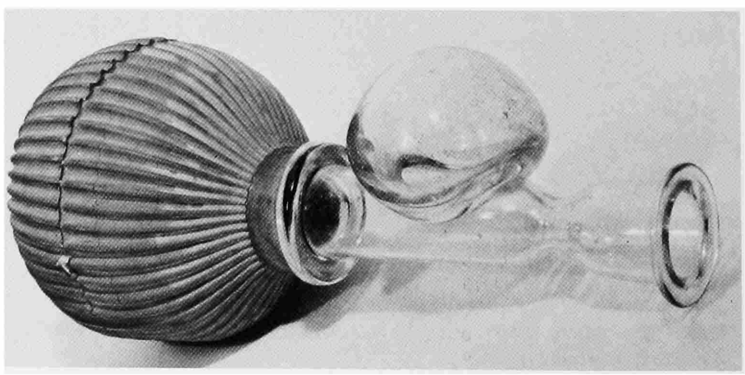

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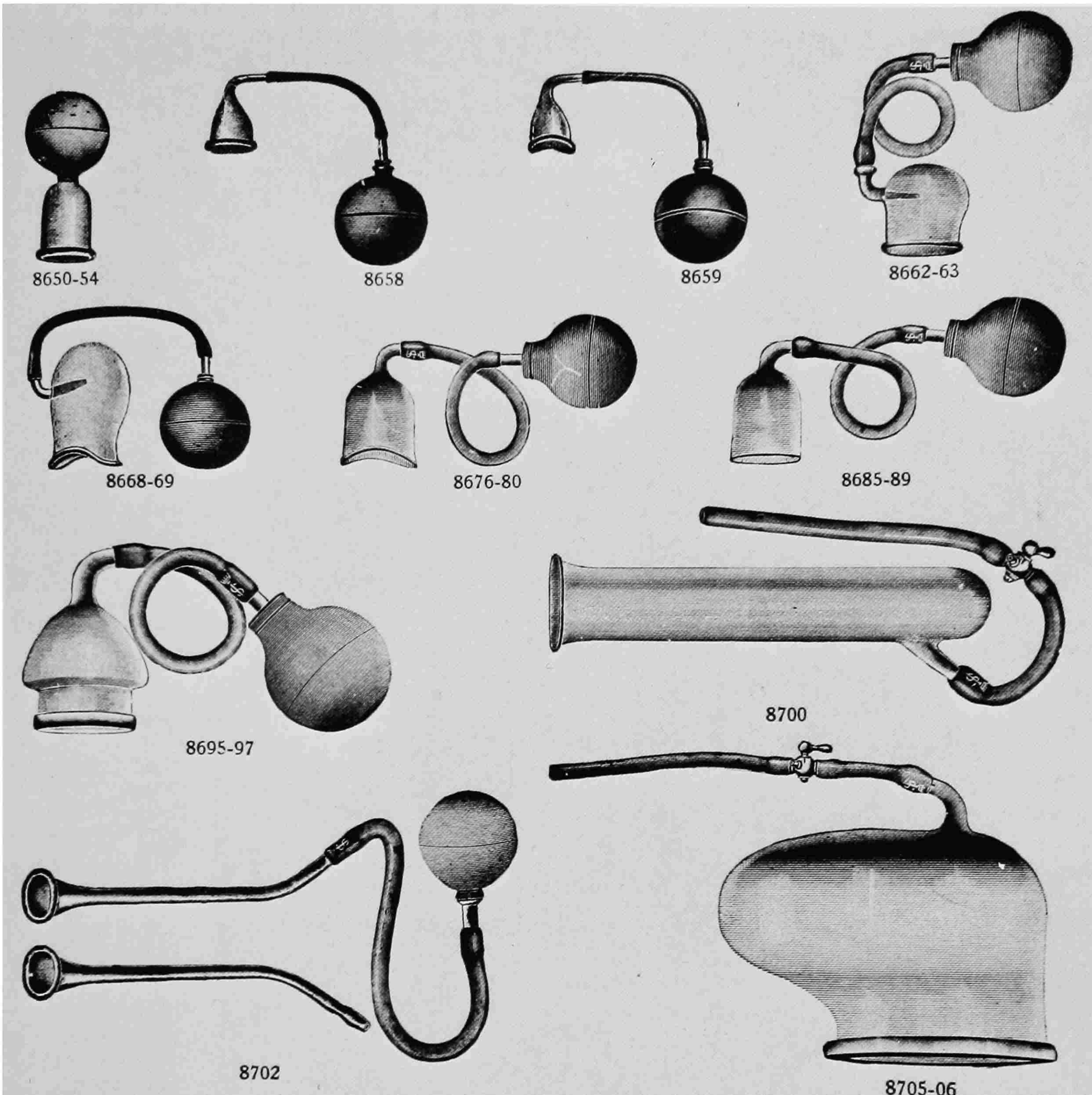
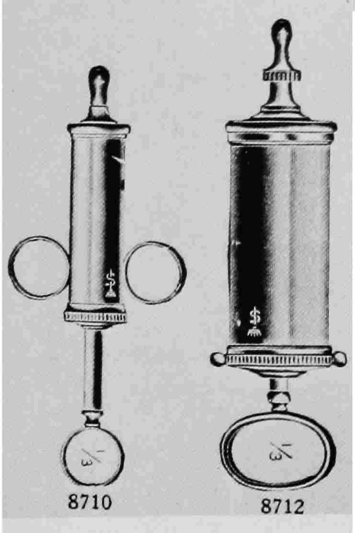




BIER'S HYPEREMIA CUPS AND PUMPS

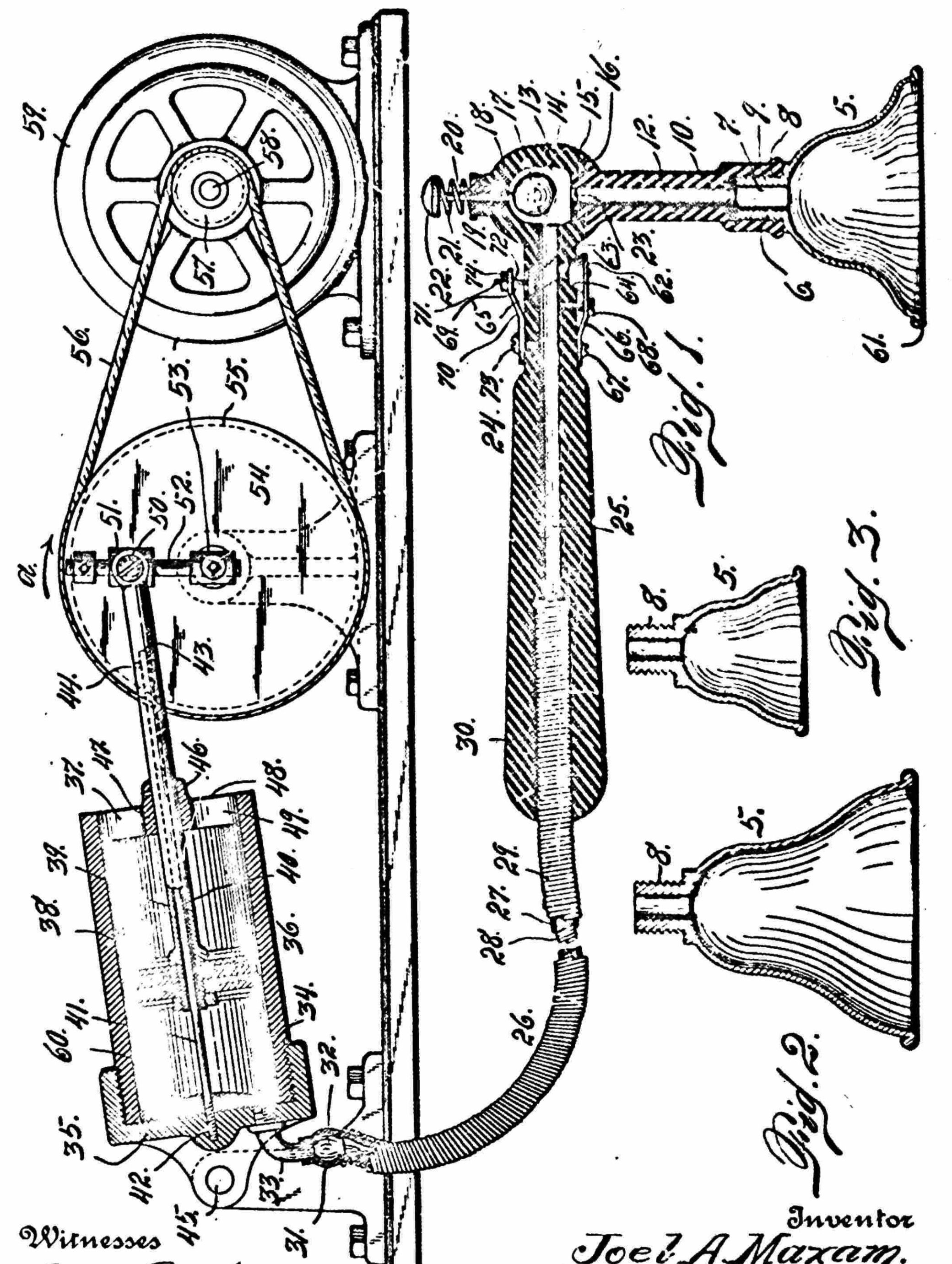
8650 . Plane edge, 1"
8651 . . Plane edge, 1¼"
8652 . . Plane edge, 1½"
8653 . . Plane edge, 2"
8654 . . Plane edge, 2⅜"
8658 . . Plane edge, ½" and ¾"
8659 . . Concave, ½" and ¾"
8662 . . Plane edge, 1¼"
8663 . . Plane edge, 1½"
8668 . . Concave edge, 1¼"
8669 . . Concave edge, 1½"
8676 . . Concave edge, 1¼"
8677 . . Concave edge, 1½"
8678 . . Concave edge, 2"
8679 . . Concave edge, 2⅜"
8680 . . Concave edge, 2¾"
8685 . . Plane edge, 1"
8686 . . Plane edge, 1¼"
8687 . . Plane edge, 1½"
8688 . . Plane edge, 2"
8689 . . Plane edge, 2⅜"
8695 . . Plane edge, 1"
8696 . . Plane edge, 1¼"
8697 . . Plane edge, 1½"
8700 . . Vaginal, one size
8702 . . Tonsil, in pairs r. and l., with one bulb, 6 sizes
8705 . . Mastitis, 4¾"
8706 . . Mastitis, 5"
8710 . . Suction Pump, small, for use by patient
8712 . . Suction Pump, large
*8715 . . Rubber Bulbs only, for above, 1¾", 2", 2¼", 2½", 2¾" diam.

J. A. MAXAM.

SUCTION AND COMPRESSION CUPPING APPARATUS.

APPLICATION FILED APR. 27, 1915.

1,179,129. Patented Apr. 11, 1916.



Witnesses

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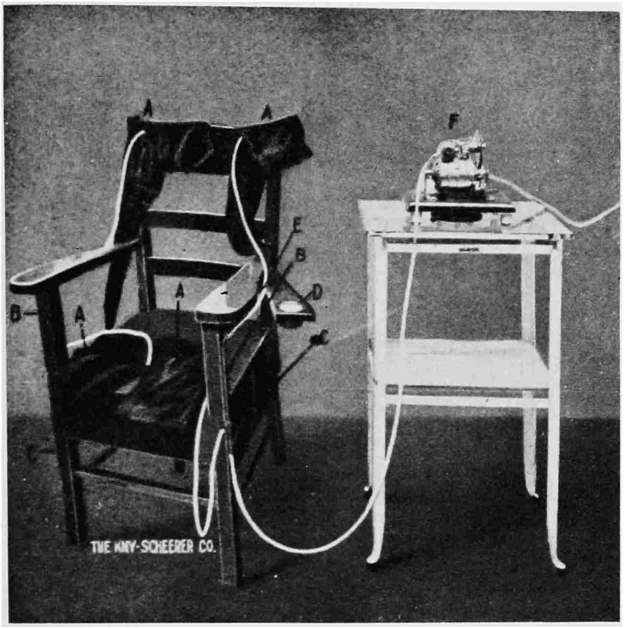
John B. Dado

Inventor

Joel A. Maxam.

By A. J. ...

Attorney



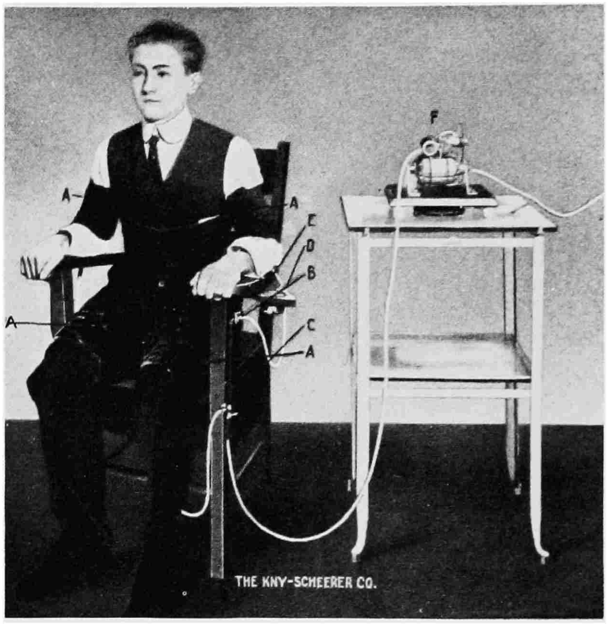


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FIGURE 86.—Patent for a complex cupping pump, J. A. Maxam, 1916. (From patent specifications, U.S. patent 1179129. SI photo 73–5186.)

FIGURE 87.—Heinrich Stern's phlebostasis chair, 1915. (From Heinrich Stern, *Theory and Practice of Bloodletting,* New York, 1915. SI photo.)

FIGURE 88.—Old-fashioned cupping in a German physician's office, Chicago, Illinois, 1904. (SI photo 45726–B.)

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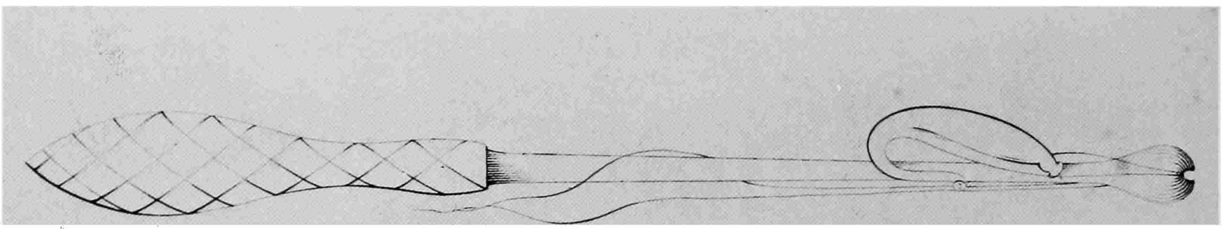

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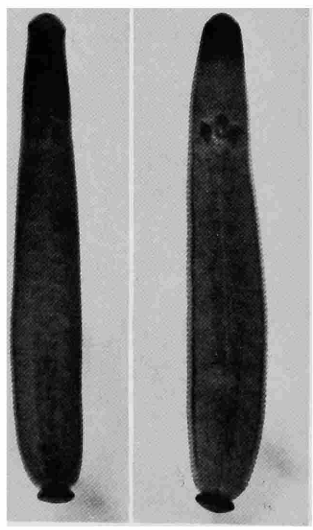
FIGURE 89.—A man employing leeches to reduce his weight, 16th century. (From P. Boaistuau, *Histoire Podigieuses*, Paris, 1567. Photo courtesy of NLM.)

FIGURE 90.—Osborne's instrument for inserting leeches into the rectum. (From J. Osborne, "Observations on Local Bloodletting," *Dublin Journal of Medical and Chemical Science*, volume 3 (1833). Photo courtesy of NLM.)

FIGURE 91.—Two leeches *(Hirudo medicinalis)* preserved in plastic. (Anthropology Catalog no. 143,077; SI photo 73–4233.)

FIGURE 92.—Satire on the theories of Broussais. The caption read, "But, I haven't a drop of blood left in my veins! No matter, another fifty leeches." (Undated print. Photo courtesy of NLM.)



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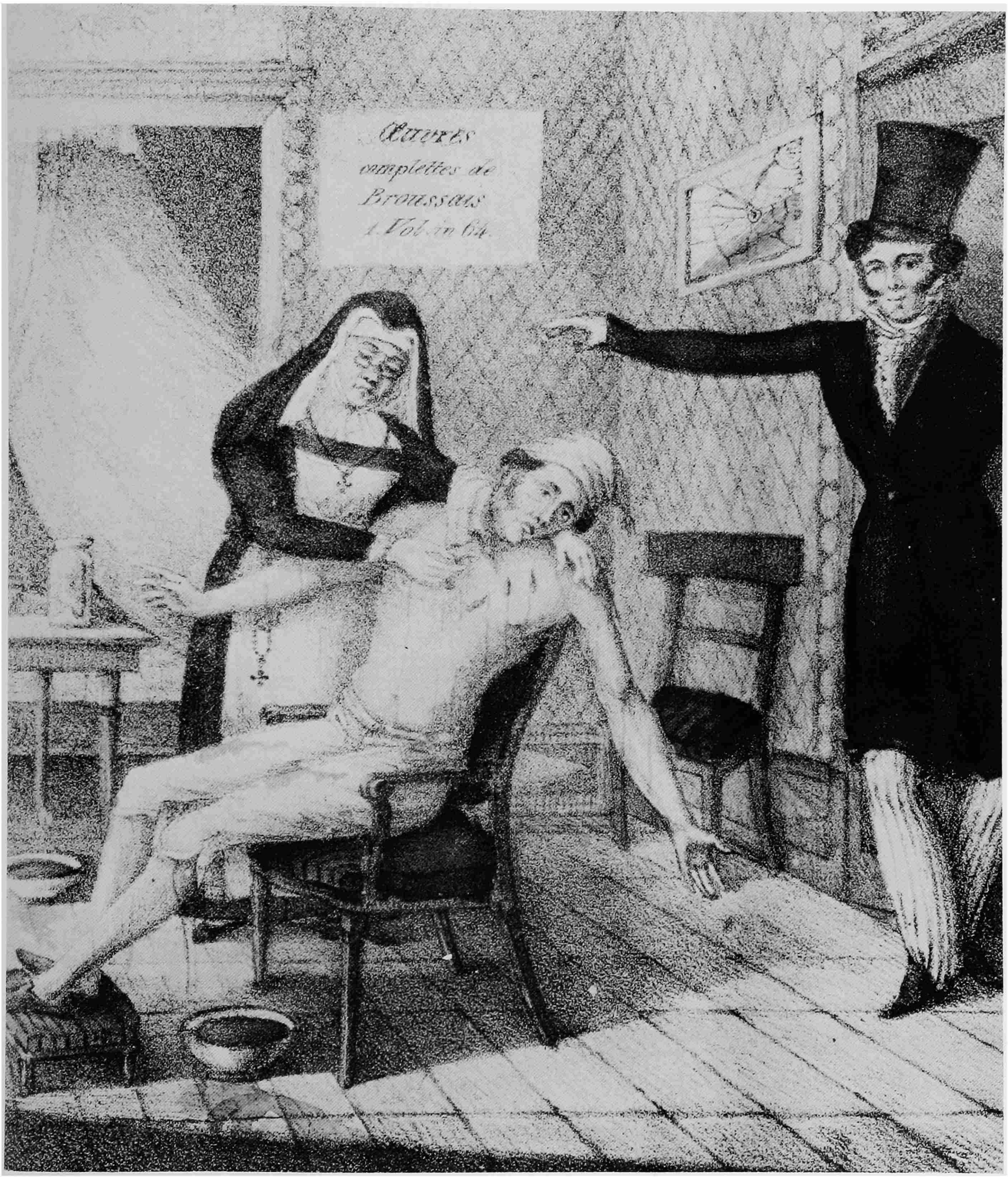
Œuvres
complettes de
Broussais
1 Vol. in 64.

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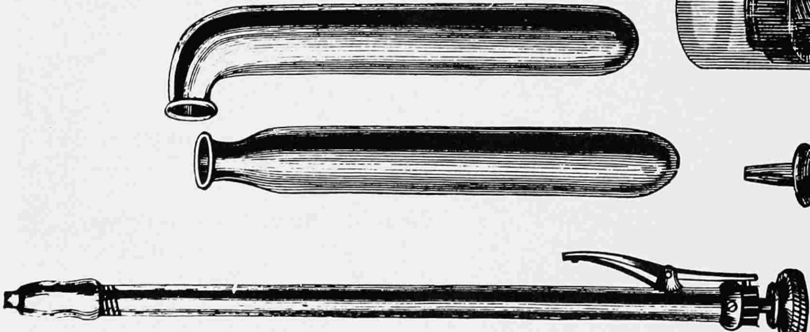

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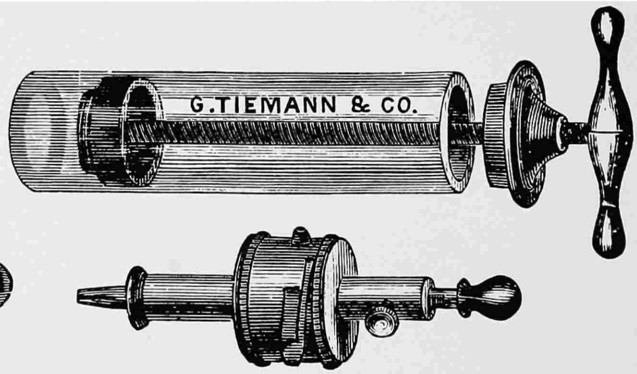

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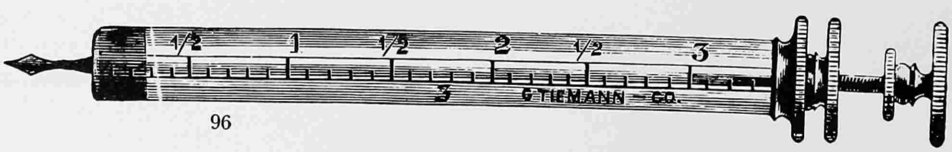

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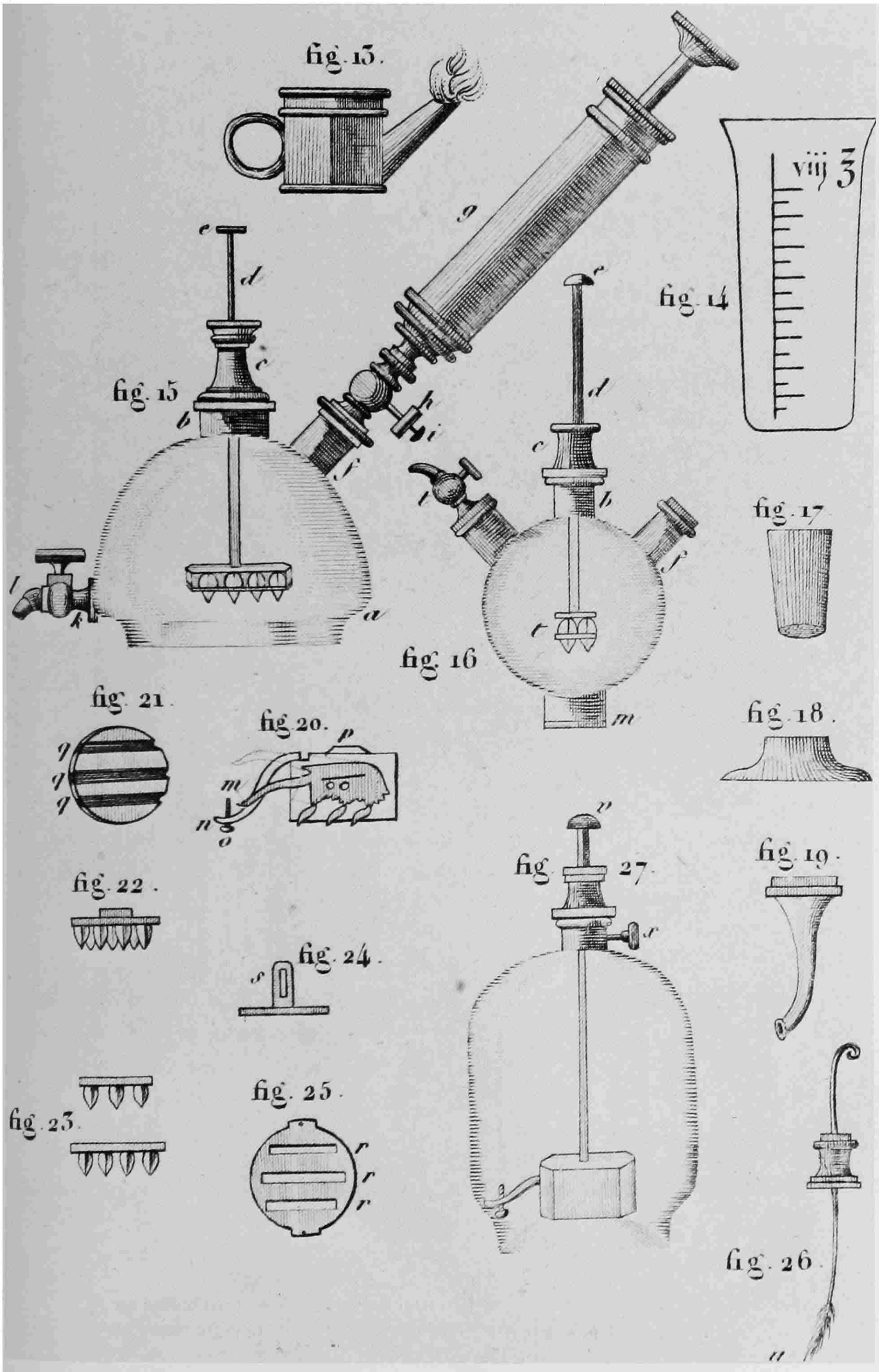

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FIGURE 93.—Woman using leeches, 17th century. (From Guillaume van den Bossche, *Historica Medica,* Brussels, 1639. Photo courtesy of NLM.)

FIGURE 94.—Heurteloup's leech. (From George Tiemann & Co., *American Armamentarium Chirurgicum,* New York, 1889. SI photo 76–13541.)

FIGURE 95.—Tiemann & Co.'s patent artificial leech. (From George Tiemann & Co., *American Armamentarium Chirurgicum,* New York, 1889. SI photo 76–13541.)

FIGURE 96.—Reese's uterine leech. (From George Tiemann & Co., *American Armamentarium Chirurgicum,* New York, 1889. SI photo 76–13539.)

FIGURE 97.—Sarlandière's bdellometer. Fig. 13 and Fig. 14 are a teapot lamp and a glass for measuring the blood taken in cupping. All the other figures illustrate variations on the bdellometer. Fig. 19 and Fig. 20 are attachments for bleeding the internal membranes. (From Sarlandière, "Ventouse," *Dictionnaire des sciences médicales,* volume 57, 1821. Photo courtesy of NLM.)

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FIGURE 98.—An artificial leech. Note the three blades on the scarificator that simulate the triangular puncture of the leech. (NMHT; SI photo 76–9120.)

FIGURE 99.—An 18th-century cutler's illustration of veterinary instruments. Shown are a spring lancet and a fleam. Knives and hooks were often added to the blood-letting blades in foldout fleams. (From Jean Jacques Perret, *L'Art du Coutelier,* Paris, 1772. Photo courtesy of the NLM.)

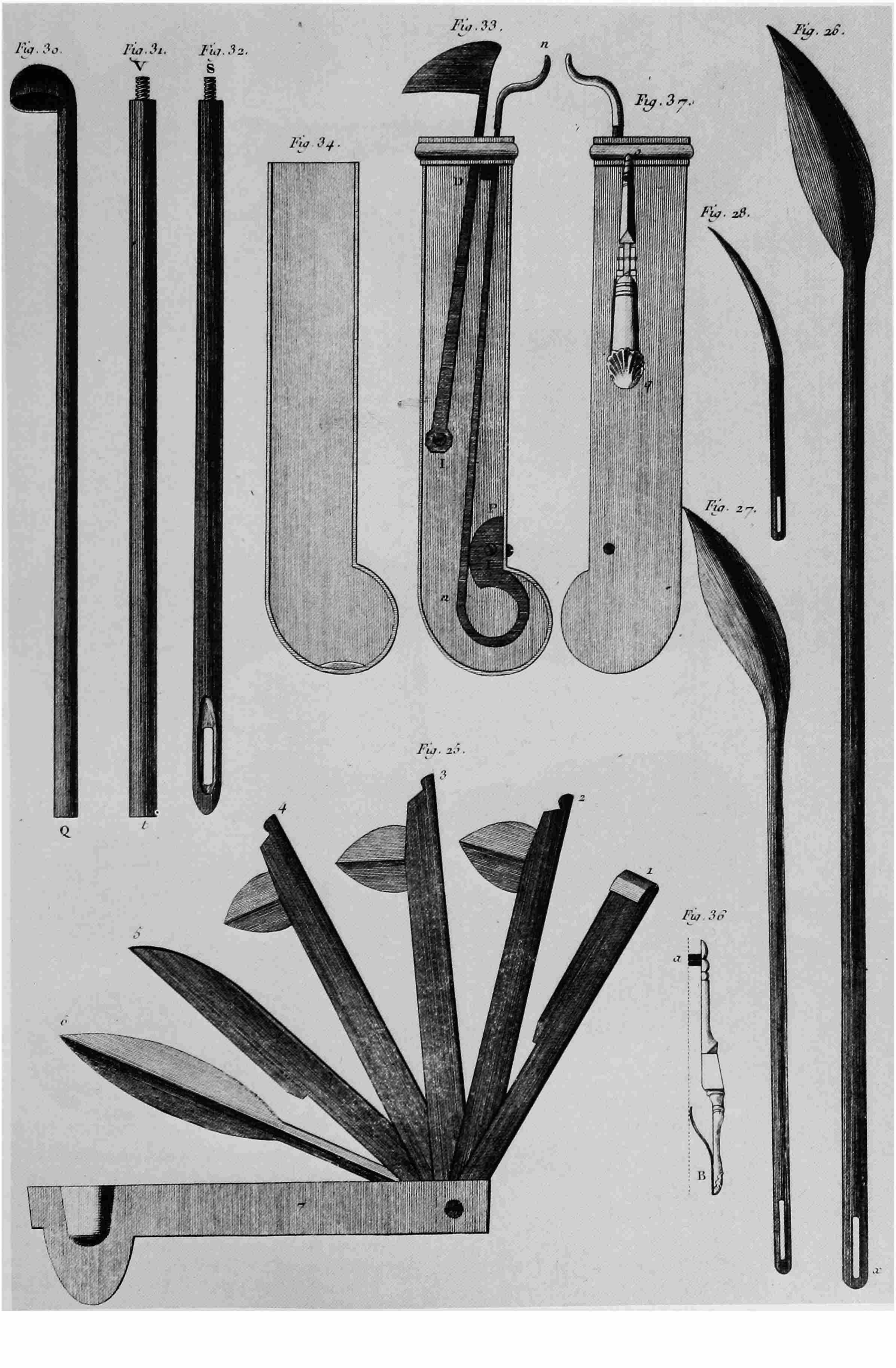
Fig. 30.
Fig. 31.
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Fig. 36
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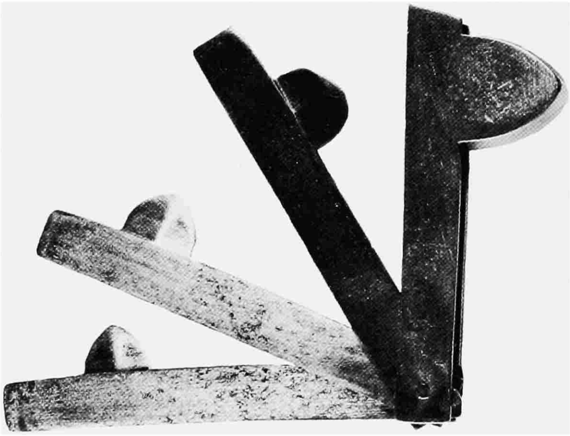

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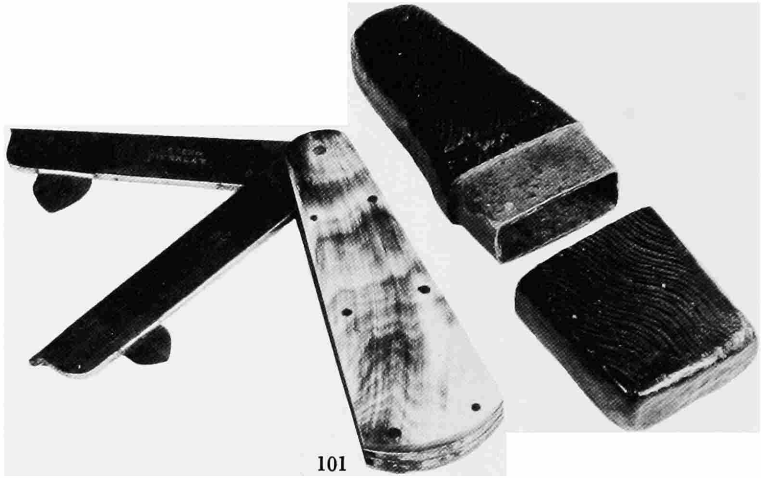

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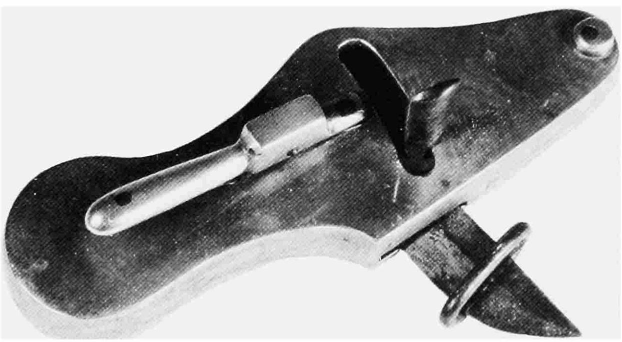

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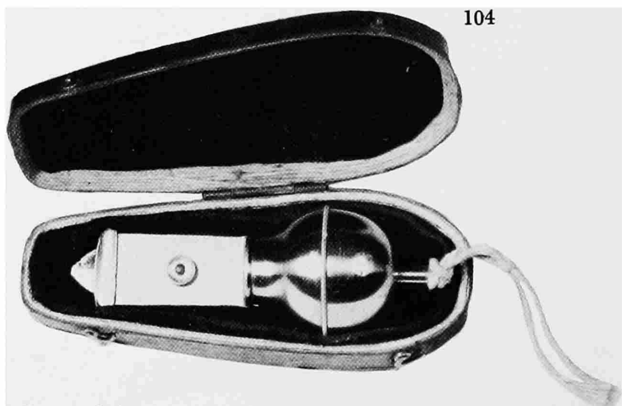


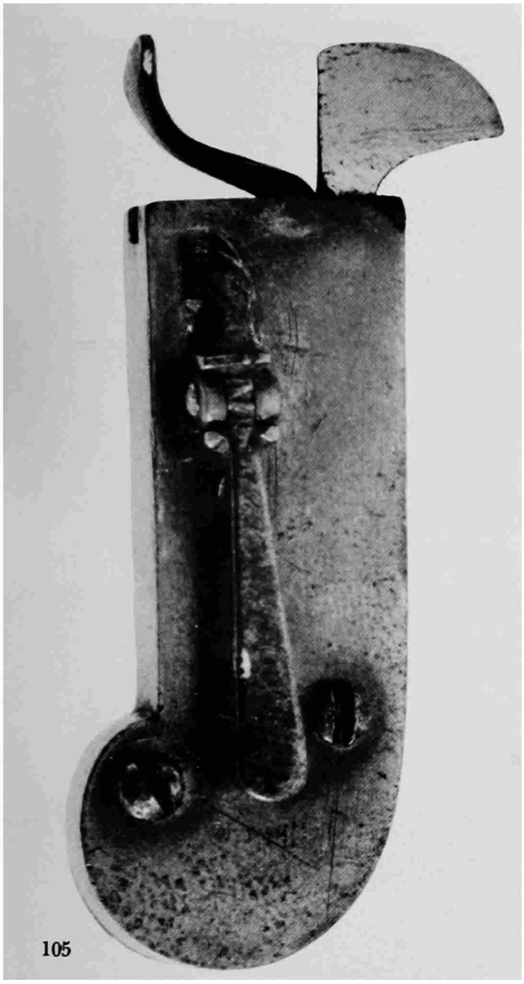
FIGURE 100.—Fleam with brass shield, 18th–19th century. (NMHT 121573 [M–3462]; SI photo 73–4206.)

FIGURE 101.—Fleam with horn shield, 19th century. (NMHT 321697.05; SI photo 76–7758.)

FIGURE 102.—Phlebotomy knife by Rodgers & Co., London. (Loan no. 316478; SI photo 76–9108.)

FIGURE 103.—Unusual shaped brass spring lancet set by a sliding catch and released by a release lever. (NMHT 321697.11; SI photo 76–7754.)

FIGURE 104.—Brass spring lancet that is set by pulling on the string and released by pushing upon the button. (NMHT 321697.07; SI photo 76–7750.)



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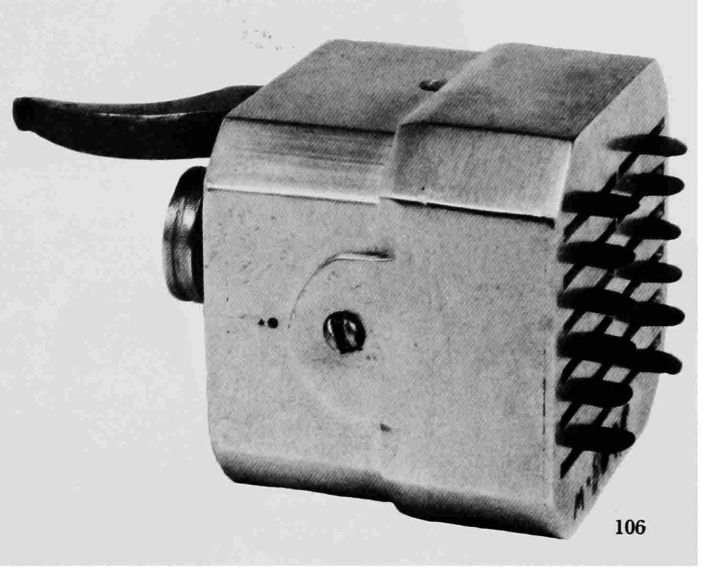

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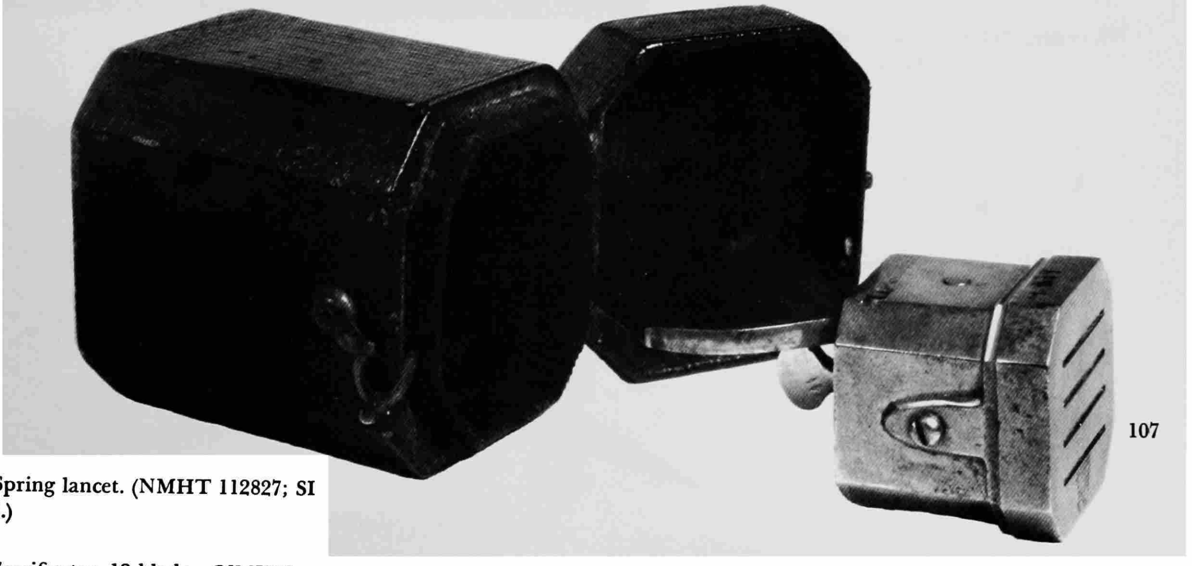

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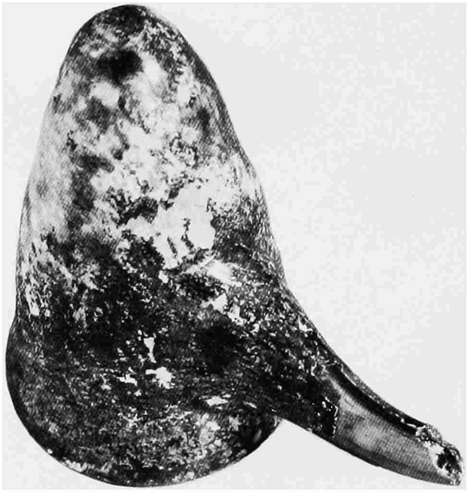
FIGURE 105.—Spring lancet. (NMHT 112827; SI photo 73–4235.)

FIGURE 106.—Scarificator, 12 blades. (NMHT 99749 [M–2336]; SI photo 76–7744.)

FIGURE 107.—Temple scarificator with case. (NMHT 233056 [M–9639]; SI photo 76–7745.)



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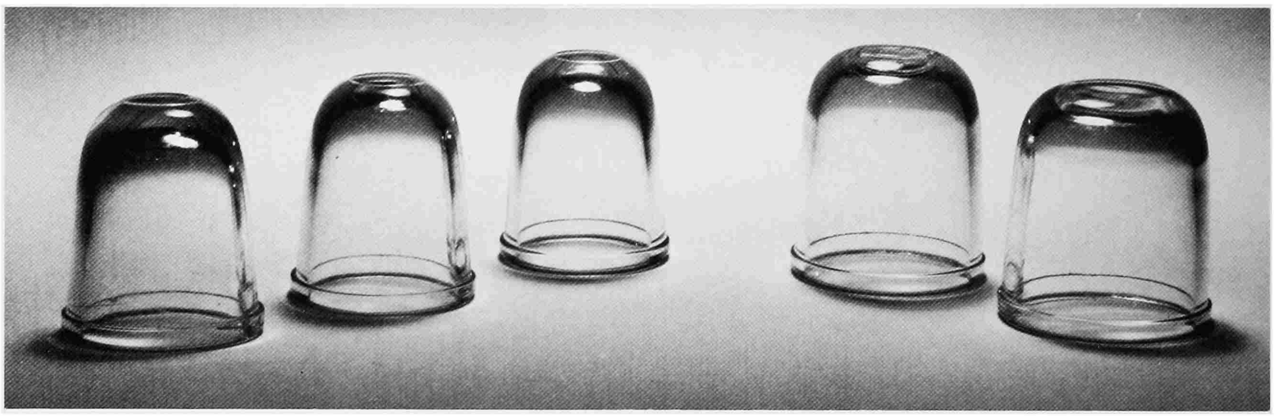

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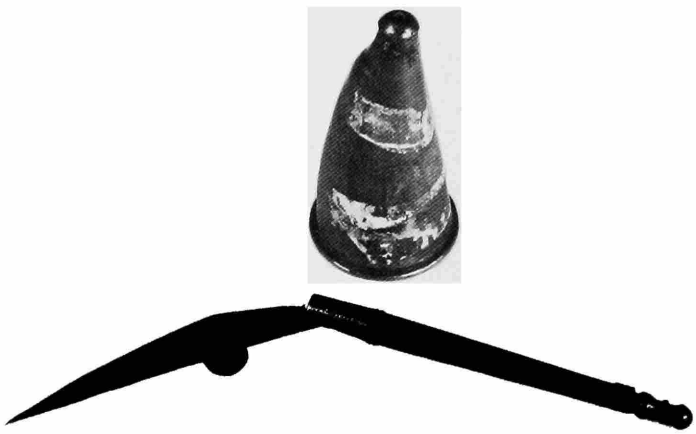

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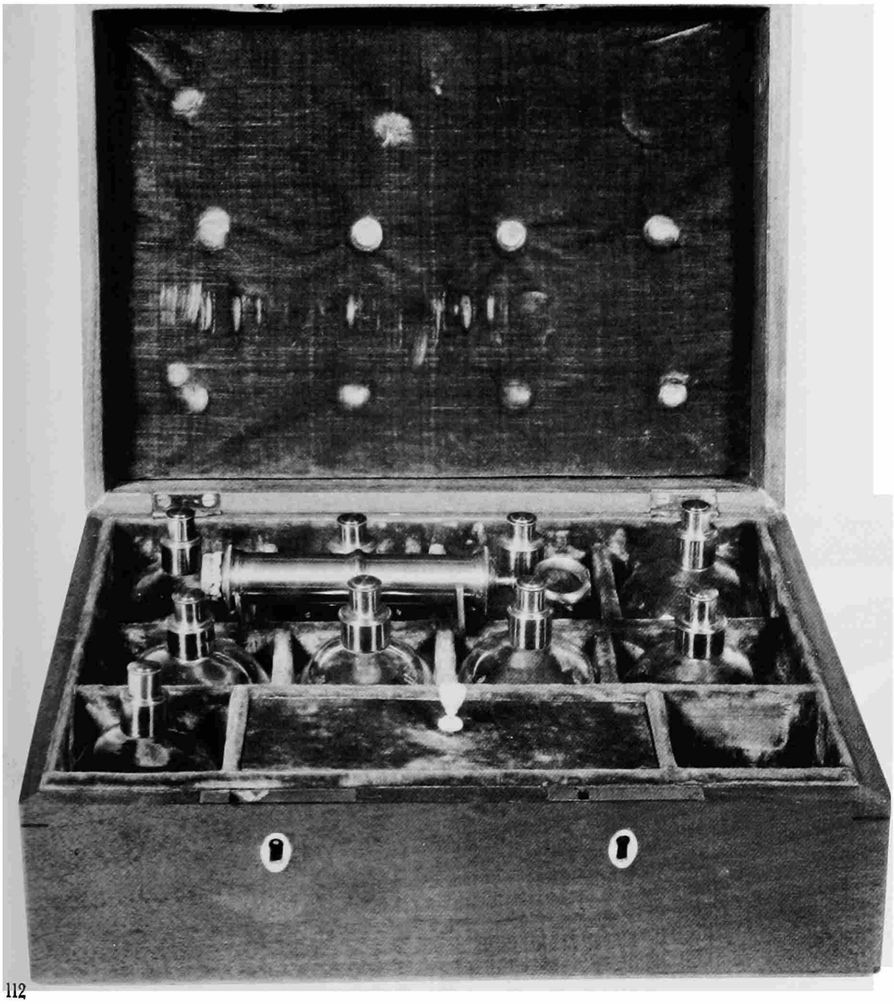

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FIGURE 108.—Persian cupping glass, 12th century. (NMHT 207389 [M–6836]; SI photo 73–4205.)

FIGURE 109.—Cupping cups, glass. (NMHT 308730.09; SI photo 74–4087.)

FIGURE 110.—Persian cupping cup and razor. (NMHT 320033.07; SI photo 76–7749.)

FIGURE 111.—Brass cup (1) and pewter cups (2). (NMHT 321697.22 and NMHT 207399 [M–6829 and M–6830]; SI photo 76–9109.)

FIGURE 112.—Cupping set. NMHT 321697.21; SI photo 76–7747.)

FIGURE 113.—Breast pump. (NMHT 220170 [M–7435]; SI photo 76–7761.)

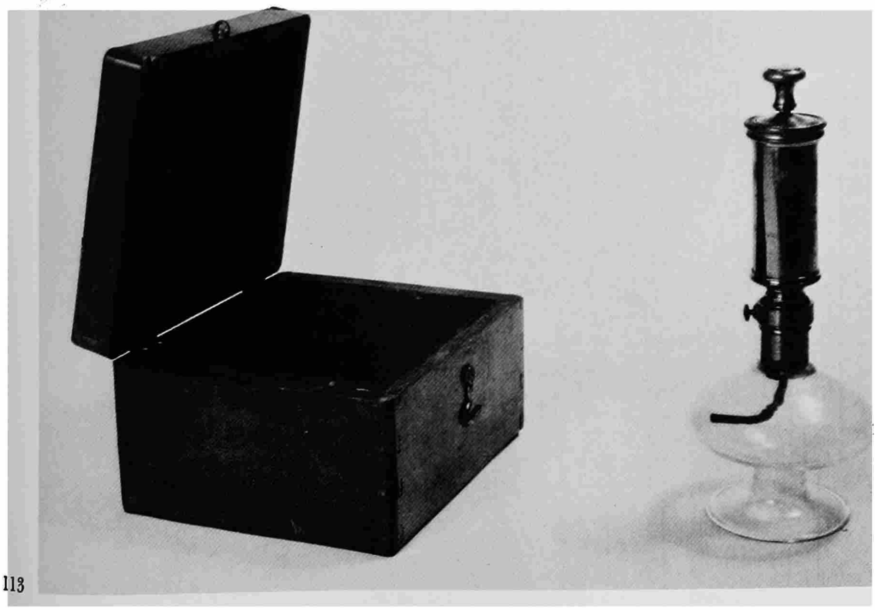

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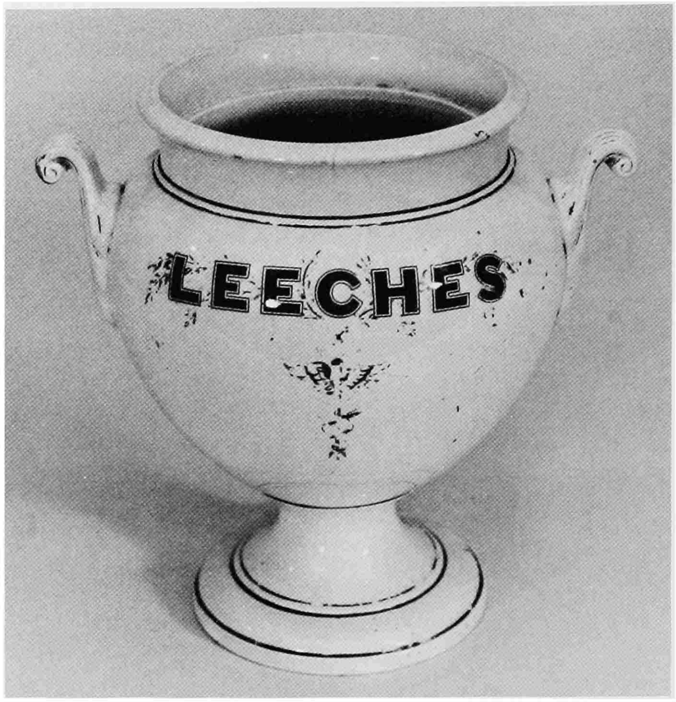
FIGURE 114.—Leech jar, minus top. (NMHT 201821 [M–6712]; SI photo 73–4232.)

FIGURE 115.—Staffordshire leech jars. (NMHT 321697.18 & .19; SI photo 76–7765.)

FIGURE 116.—Leech cage. (NMHT 1977.0576.02; SI photo 77–13984.)



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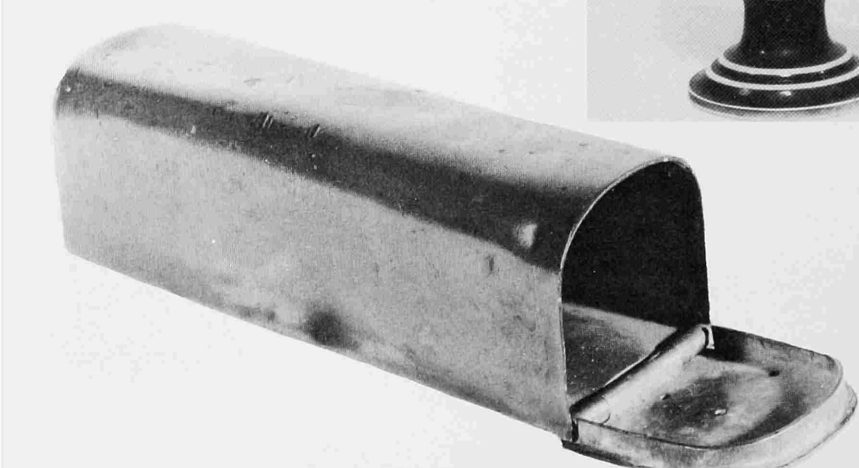

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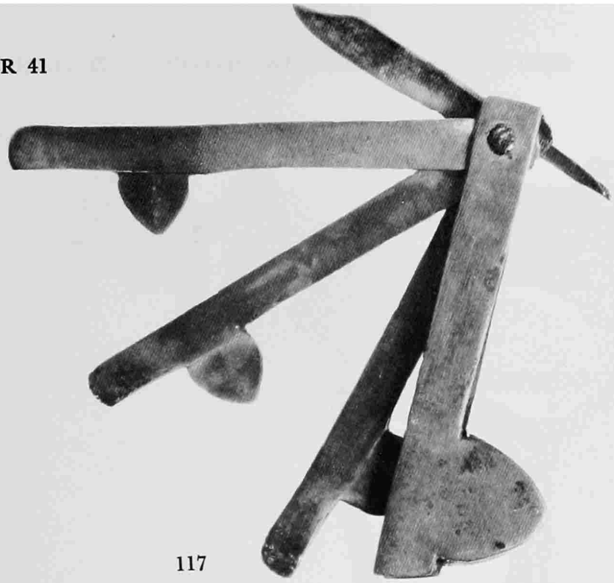

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FIGURE 117.—Veterinary fleam. (NMHT 218383 [M–9255]; SI photo 61125–A.)

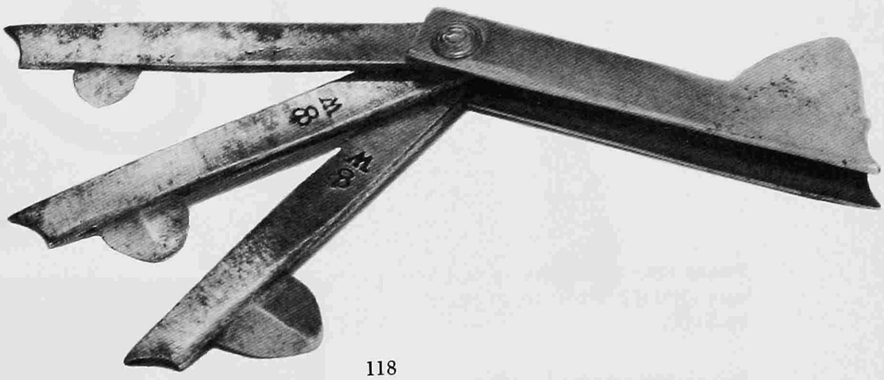

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FIGURE 118.—Veterinary fleam. (NMHT 233570 [M–9665]; SI photo 59139–H.)

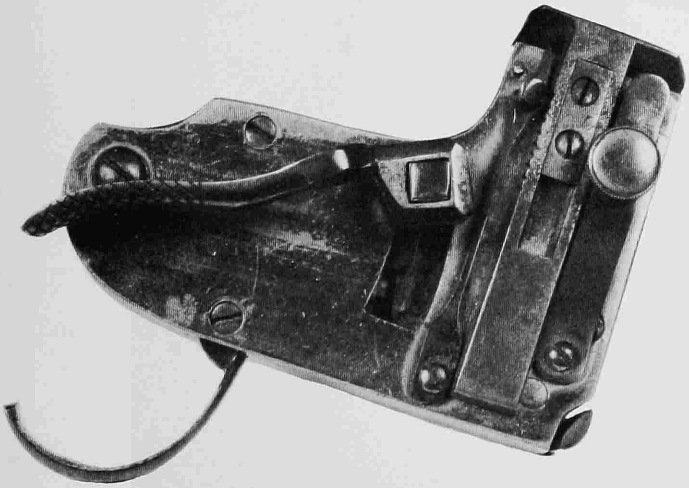

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FIGURE 119.—Veterinary spring lancet. (NMHT 321697.08; SI photo 76–7756.)

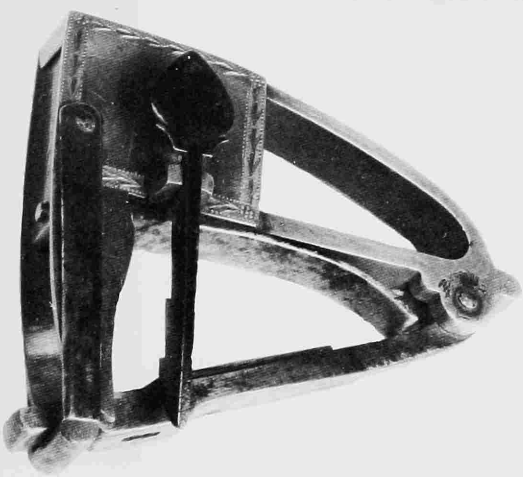

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FIGURE 120.—Veterinary spring lancet. (NMHT 321697.09; SI photo 76–7755.)

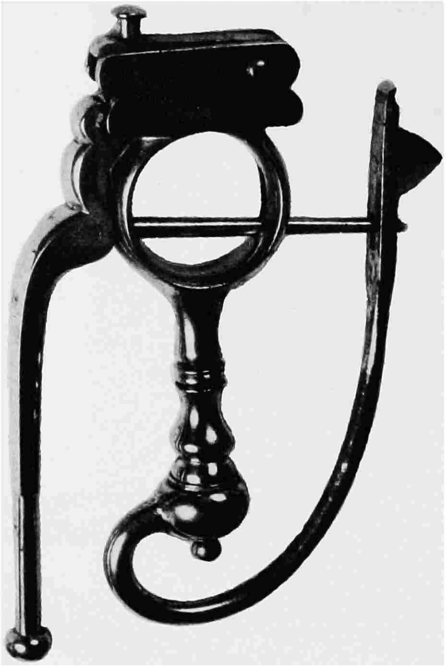

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FIGURE 121.—Spring lancet, 18th century. (NMHT 321697.10; SI photo 76–7753.)

FIGURE 122.—Spring lancet, 19th century. (NMHT 1977.0576.01; SI photo 77–13961.)

FIGURE 123.—Counter-irritation device. (NMHT 89797 [M–4305]; SI photo 72–11274.)

FIGURE 124.—Barber surgeon's set, 18th century. (NMHT 199536 [M–6684–6692]; SI photo 73–4207.)

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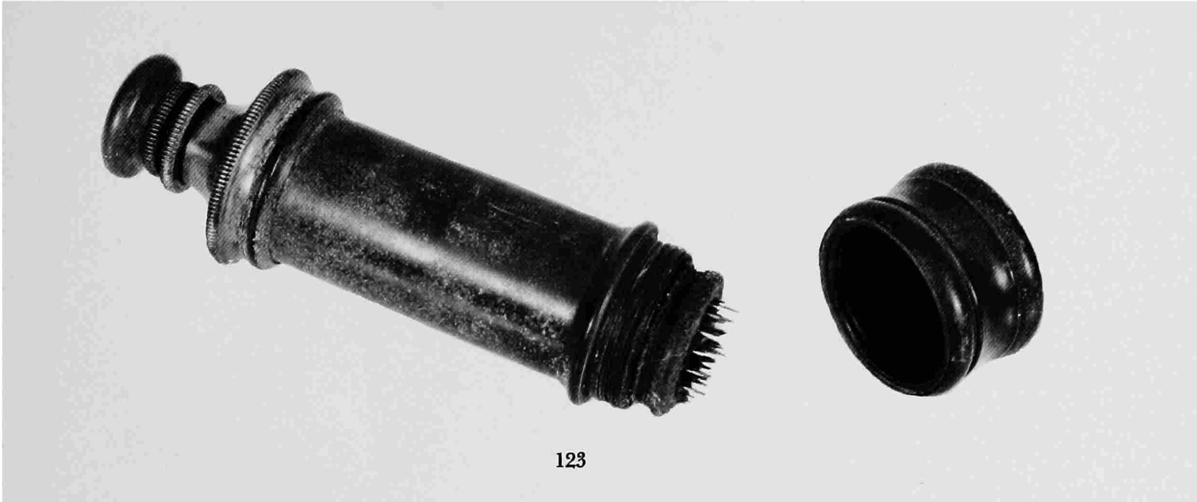

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