THE NORTH AMERICAN AND WEST INDIAN DIGGER WASPS OF THE GENUS SPHEX

(*Ammophila* auct.)

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E. O. PAINTER PRINTING COMPANY
DELAND, FLORIDA
1934
First copies mailed Feb. 1, 1934.

Errata.

Page 30, line 26: for guerinii guerinii read placidus guerinii.

Page 30, line 28: for guerinii placidus read placidus placidus.

Page 30, line 30: for guerinii extremitatus read placidus extremitatus.

Page 36, line 17: for guerinii guerinii read placidus guerinii.

Page 36, line 20: for guerinii placidus read placidus placidus.

Page 36, line 23: for guerinii extremitatus read placidus extremitatus.

Page 109, line 10: for guerinii read placidus.

Page 166, lines 5 and 8: for Sphex guerinii placidus read Sphex placidus placidus

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INTRODUCTION

The material on which this study is based was received as loans from the American Entomological Society, the United States National Museum and from many other collections, both public and private, and consisted in all of many thousand specimens. The types present in these collections were also studied, in some cases several times, and in 1913 I examined nearly all the types of American species described by European workers on the group and now in various European collections. This aided greatly in the recognition of the earlier described species from this country.

The study was begun more than twenty-five years ago in such moments as could be spared from regular duties. To this fact and to the large number of specimens available, must be attributed the long time it has taken to complete it. The very abundance of material of itself has prolonged the work. If only a thousand specimens had been available the task would have been completed much earlier and more of the species described by the older workers certainly would have been retained. But the numbers available for study from many different sources revealed a range of variation of some of the species which has led to uniting many of them and it would have been impossible to establish their identity without the long series of specimens at hand. The delay in completing the work, then, has perhaps been atoned for, in part at least, by a more complete establishment of synonomies.

To the various museums and persons who have loaned the material studied I wish to express my thanks for their kindness. In

Europe the uniformly friendly co-operation given me by those in charge of the collections at Wien, Berlin, Lund, Kiel, Paris, London, Oxford and elsewhere, so freely given, was of great assistance in my work.

I have not attempted any special research on the morphology of these insects. Where names were available for the areas, plates or markings it was desired to use, they have been adopted; where no name for such a place was found it has been given one. These names and the parts to which they apply are stated and explained in the section on External Structure and most of them, at least, are also shown in the drawings, so that no difficulty in following the specific directions should be met with.

References to the literature under each species are probably by no means complete in all cases. The original descriptions are all given, together with such others since Dalla Torre's Catalogus Hymenopterorum as have come to my notice. In these lists the names of those species of which I have seen and studied the types are marked with a *. All statements with reference to specimens seen in Europe are as of the year 1913 when I studied them.

I am far from in accord with the present apparent tendency to multiply the different kinds of types by which to designate insects in various stages or having different relations to the original types. But, accepting the situation as it is, I have found it apparently desirable to add another to the list of such types, viz.; the Parallotype. The original insect described is, of course, the Holotype, and if others were used in making the description they would be Paratypes. If both sexes were originally described at the same time and by the same person their designations, following present usage, would appear to be Holotype, Allotype and Paratypes, and the describer would have the right to decide which sex should receive the Holotype designation. The other specimens of both sexes would be Paratypes, and Holotype, Allotype and Paratypes together would represent the material used by the describer. If only one sex was originally described, the material used, would in that case, be Holotype and Paratypes, all of the same sex. When, later, the other sex was described by someone else, there

would be an Allotype and, if there were others, paratypes of the Allotype. But to mark these last as paratypes would place them in the same position as the paratypes of the other sex which were described by a different person. To avoid this confusion of authorship, then, I have suggested and used elsewhere the term Parallotype to indicate paratypes of an Allotype which was described by some one other than the original describer of the species.

The next revisor of this genus will probably find it profitable to give particular attention to the insects placed here under the species *aberti, breviceps, junceus* and *chiriquensis, politus* and *parapolitus, strenuus* and the *arvensis* group. Some of these possibly, may be united while others may need separation into two species. No revision, however, should be attempted without a long series of each species from all parts of its supposed range.

EXTERNAL STRUCTURE

Purely as a matter of convenience the Propodeum (first segment of the abdomen) will be dealt with in connection with the thorax and the two segments of the petiole (second and third abdominal segments) will be considered as a separate portion of the body, leaving the remainder of the abdomen to be treated of as though it were the entire abdomen.

HEAD. In *Sphex* the outline of the head as seen from above may be described as varying between quadrangular with rounded corners and somewhat hour-glass shaped. Where the frons between the eyes is only slightly, or not at all depressed and the circular depression behind, surrounding the occipital foramen (*occipital fossa*) is not very evident from above, the quadrangular outline is approached (Fig. 8). It is liable to be modified somewhat however, by the degree of development of the cheeks, above. When these extend laterally almost as far as the lateral surface of the compound eye the quadrangular outline with rounded corners is nearly complete; where they retreat quickly from the hinder margin of the eye it is less exact. When the frons is depressed strongly between the eyes and the occipital fossa is evi-

dent from above, the effect of a head narrowed in the middle, front to rear—a somewhat hour-glass shaped head—is obtained (Fig. 9).

From in front the outline in the female with the mandibles closed is usually between the circular and broadly oval. In the male, though this outline may be preserved above, the elongation downward of the clypeus and the narrowing downward of the compound eyes prevents describing the outline by either of the above names.

The Clypeus in the female does not usually extend very far below the compound eyes and its margin is nearly the same in most species (Fig. 10). This margin is generally curved downward somewhat and bears two short teeth, often so small as to be easily overlooked, which divide it about into thirds or into a median half and two lateral fourths. Between the teeth the outline generally is somewhat sinuate on each side of a slight median notch or emargination and often with a slight flange or rim. Between the tooth and the eye there is less or no rim or flange but the outline is also sinuate.

Whether the Frons is greatly depressed medially or not, a median indented line is present, running from the antennal fossa upward to the front ocellus where it forks, each branch passing obliquely outward to behind the lateral ocellus or even farther before becoming lost. A similar indented line joining these branches behind the ocelli is frequently (generally) present and then the indented lines mark the limits of a slightly raised ocellar triangle or area. The lateral ocelli, when viewed from the front of the head are sometimes so far up as to lie on the periphery or vertex, but more often the vertex shows above, behind them. The ocelli themselves form the corners of a triangle, sometimes practically equilateral, but more often the lateral ocelli are farther apart than either is from the front one. The distance apart of the outer margins of the lateral ocelli as compared with that from them to the compound eye has frequently been made use of as a distinctive character in separating species but I have had little success in its

use, the differences being too slight and the difficulty in getting accurate measurements too great.

The degree of development of the cheeks has already been referred to. They may be broad and form quite a part of the lateral margin of the head as seen from above, or they may be quite narrow, the eye forming most of the margin as is at least usually the case in the male. They may extend backward some distance, giving that part of the head a greater length from front to rear, viewed from above, or they may project backward only a little. Whatever the form of the cheek above, it narrows rapidly below the middle of the head. The antennae are black or nearly so, the scape and pedicel usually shining, the filament dull and often rather grayish. Where this condition occurs no reference will be made to the antennae in the specific descriptions, but departures from it will be noted. The mandibles are usually black or piceous, or reddish piceous. When they have a ferruginous band or differ otherwise from normal their condition will be stated.

THORAX. (Fig. 1). The pronotum of the prothorax may conveniently be divided into the Neck and the Collar. It lies above, and the proplura below, the prosternum hardly showing on the underside except by dissection. The Neck, which is small, is attached to the head at the occipital foramen; is rather flattened and becomes broader as it goes backward. At its sides the suture between it and the propluron, running downward and backward, is evident. The neck, after continuing backward a short distance, turns upward to become the collar from there to the mesonotum, sometimes rising only very slightly and gradually (Fig. 20); generally very strongly (Fig. 24) and in one or two cases seeming to project forward slightly over the neck, making even less than a right angle with it (Fig. 30). After attaining its full height its surface curves backward and sooner or later downward and articulates with the front margin of the mesonotum. Viewed from in front, the collar is usually evenly rounded from side to side over the top though in some cases a slight median depression occurs, particularly near the mesonotum, and in others a more or less three-lobed condition is found (Fig. 40). Its outline, seen

in profile, may differ in the two sexes, being rounder, often, in the males than in the females. At the sides the collar becomes more nearly vertical and continues down to the proplural suture, interrupted about half way down by a more or less ear-shaped lobe which projects backward from its margin, called the Prothoracic Lobe (pl.). In front of this, between it and the proplural suture is generally an elongated depression, somewhat gutter-shaped in form and which I term the Gutter. This usually appears slightly above the base of the prothoracic lobe and extends downward to near the fore coxa. Sometimes the gutter is limited in front by a rather definite ridge, but in other cases the surface in front is quite flat; i. e., the gutter has no definite anterior limit. In most cases, at the point in front where the neck turns upward to become the collar, there is an indented line which runs outward to, or near the top of the gutter. This is here termed the Lateral Indented Line. When the surface of the collar is transversely ridged above, these ridges may continue down the sides, in the gutter and even in front of it, thus making the entire pronotum except the neck and prothoracic lobe rugose. Generally, though, the ridges end about at the lateral indented line. When the collar is not ridged (and most often when it is) the gutter may be smooth, but it is liable to be weakly striated or have a few faint ridges running along it. Punctures, small, medium or coarse, are usually present on the entire pronotum except in the gutter, and often, also, between the ridges when these are present.

The surface of the Mesonotum, with which the collar articulates behind, is usually punctured. In some cases these punctures tend to form transverse rows, particularly in front and toward the front corners of the plate and thus often resemble weak and incomplete ridges. Real ridges, transverse in direction, also occur in some species, sometimes continuous across the plate; sometimes interrupted by a median indented line or double line which runs backward over more or less of the plate. Ridges, generally rather fine, often occur on the sides of the plate, beginning about opposite the tegulae, running backward and inward and either converging toward the median line or crossing it and making more or

less U-shaped ridges. They seem to vary somewhat in their course in individuals of the same species.

Behind the mesonotum lies the Scutellum. This plate may vary slightly in length from front to rear and may be quite flat or rather high. Its surface may be smooth with only a few punctures; smooth with faint punctures behind, only; or it may be rather closely punctured; but most often it is definitely rugose, the ridges running either longitudinally or diverging somewhat, backward, or in some cases curving around the center near the front of the plate on the median line, thus forming inverted U's with divergent rather than parallel arms. Of course there is no connection of the more lateral ridges on the two sides in such cases. Unfortunately I have been unable to connect the different patterns formed by these ridges with different species, and beyond separating them into smooth and ridged have not been able to use this feature for identification.

The next plate behind, the Postscutellum, is narrower than the scutellum. It is rather rounded laterally in many cases but may be higher toward the front than behind and sometimes seems to have a short transverse ridge there, rising above the general level. The surface of the plate sometimes shows traces of ridges, but in general appears to be closely, irregularly punctured, presenting a lack of definite markings and may therefore be described as confused.

Behind the postscutellum comes the Propodeum (first abdominal segment). It may be divided, for convenience, into a dorsal portion or Disk (prd); an End (pre), and the Sides (prs). The disk is quite sharply separated by its markings from the other portions but there is no dividing mark between the end and the sides other than the direction in which each part faces. The disk is more or less shield-shaped, transverse in front. Its lateral edge runs backward and sometimes slightly inward to the Propodeal Spiracle (sp), then broadens out more or less, after which, curving backward and inward it finally meets the edge from the other side to form a point or tip on the median line.

Variation from this general form gives a disk rather narrow and with straighter sides. The spiracle, which sometimes seems to have caused the disk to narrow somewhat in order to get by it, at other times seems to have had no such effect. The surface of the disk is generally rather flattened, particularly on its hinder half and its tip often extends down a little onto the end of the propodeum.

The markings on the surface of the disk vary greatly and I have failed entirely to find in them any basis for specific distinctions. In general terms the entire disk may be described as rugose, the ridges often more or less concealed by punctures, at least along the middle. Sometimes there is more or less of a median longitudinal ridge but more often there is no trace of it. The ridges in front may be almost transverse, but farther back become more oblique, running back and out: behind the spiracle their outer ends may bend forward; and near the tip they may again become nearly transverse. On the other hand the ridges may be nearly longitudinal in front, bending outward only slightly, but becoming more oblique further back, and various conditions between these extremes occur.

Punctures, when present, occur in a band more or less the width of the disk in front and narrowing gradually backward but rarely if ever, ending in a point behind. I have called this area the Median Band in descriptions. Over this area punctures may break up the ridges so much as to produce a strip of confused markings showing no definite system. This median band is very likely to be covered by sericeous or pubescent hairs, but the sides of the disk are usually bare and a very pronounced, glossy, shining black. In some cases these sides are shagreened, implying the presence of very fine, pruinose hairs, but I have never found any of these. In a few species the entire disk has a very deep, dull black color with no trace of glossy black on its sides.

On the end of the propodeum is the articulation of the petiole. Above, between this and the tip of the disk there is generally a depression or fovea, and at each side of the petiole a pubescent spot. This may vary greatly, from none, or a mere trace in a few

species, to a large spot extending up to the disk near its tip, and it may also cross above the petiole, uniting with the one on the other side. At its base it may spread out laterally to the Metacoxal knob above the hind coxa at the metapluron (mtk) and unite there with a pubescent band generally present, which begins on that knob and runs forward along the propodeo—metaplural suture (pms), either on the one plate, on the other, or on both. Any part of the propodeal end not concealed by pubescence may be ridged or punctured or both and this condition continues around onto the propodeal side. Here there is more or less rugosity, the ridges running down and often forward, somewhat, particularly toward the front of the plate, mingled with punctures. The ridges are not always complete, but may be short, discontinuous, or even anastomose slightly in a few species. In one section of the species the ridges start down from the sides of the disk, turn sharply forward and run nearly parallel to the axis of the body. Beside the disk, between its base and the spiracle, there is frequently a pubescent spot, or at least a trace of one, but this is often very hard to see, especially in specimens with closed wings. The spiracle (sp) itself may have its margin black or lighter; even ferruginous. The propodeal side (prs) extends forward to about opposite the base of the disk, then turns upward to this base, a deep indentation being usually present at the point where its margin makes the turn upward.

Below and also in front of the propodeal side lies the Metapluron, extending from the hind coxa to just below the hind wing. On this plate, directly above the coxa, is a pronounced elevation, seemingly to prevent any lateral movement of the coxa. I have called it the Metacoxal Knob (mtk). The front margin of the metapluron, marked by the meso-metaplural suture, runs somewhat parallel to the propodeo-metaplural suture from just behind a small Mesocoxal Knob (msk) to a point in front of the indentation at the corner of the propodeal side, then turns upward, though diverging somewhat from the front end of this side, nearly to the level of, and slightly in front of the hind wing. From the angle where the meso-metaplural suture turns upward, to the

indentation at the lower front corner of the propodeum is an area usually marked off from the lower part by a slightly indented, somewhat curved line or other indication which causes this upper part of the metapluron to appear almost as a separate plate. To this part, though not strictly triangular, I have given the name Metaplural Triangle (tr.). The lower part of the metapluron bends downward under the body and covers the space between the meso- and metacoxae.

When the metapluron has a pubescent band it almost always lies along the suture between the metapluron and propodeum, but occasionally it crosses over onto the latter plate. Markings—ridges and punctures—on the propodeum usually extend across the suture onto the metapluron, but are liable to be more incomplete, less continuous ridges and tend to become lost toward the front. On the triangle fine parallel ridges, running more nearly horizontally, are usually present.

The Mesopluron is separated from the metapluron by a meso-metaplural suture (mms) which arises just behind the mesocoxal knob and runs forward and upward as already described, to beyond where the metapluron turns upward against the triangle to an irregular area lying below the fore wing which I call the Subalar Area. Below, it passes under the body, meeting its mate of the other side, along the midventral line. In front it continues to behind the fore coxa where it meets the prothorax and turns upward forming the pro-mesoplural suture, over which, about half way up, the prothoracic lobe projects backward. Above this it is in contact with the margin of the mesonotum nearly to the outer front corner of the tegula above the fore wing.

The Subalar Area (saa) is limited below by a deeply impressed line running downward and backward from in front, for a time, then turning more upward. Above this line the surface of the area is bent outward so that it faces more downward than the rest of the plate, below. It extends up toward the wing a short distance, then forms a sharp ridge, somewhat curved, above which it turns inward to its edge under the wing base, this part, normally, not being visible. Behind, the visible portion of the

subalar area extends below the hind wing with rather irregular margins. From near the angle of the impressed line which marks the lower edge of the area an indented line passes downward, nearly straight or somewhat curved, behind the prothoracic lobe. This indented line, the Episternal Suture, may end about opposite the lower margin of the prothoracic lobe or it may continue down around the body, ending behind the fore coxa. It sometimes bends backward for a short distance, opposite the top of the prothoracic lobe, then turns forward and runs down the side of the plate, the backward and forward turns forming a widely open V lying on its side.

Sometimes this suture is quite deep near its upper end and its front edge projects slightly backward over the groove, but passing downward it soon becomes only an indented line which is its condition everywhere in most cases. The nature, path and extent of this episternal suture are useful characteristics in analytical work.

Behind the episternal suture in front; the lower margin of the subalar area above; the meso-metaplural suture behind, and a more indefinite line below, lies a somewhat swollen portion of the mesopluron, usually rather rectangular in outline, which I call the Mesoplural Rectangle (r). Very often, about opposite the middle of the prothoracic lobe, the episternal suture may appear to have a short backward branch, or a smooth, depressed dash is present instead; or the suture running backward to form the V lying on its side may be present. Either of these features indicates the lower limit of the rectangle.

In some species there is an area projecting laterally, either quite strong and almost pointed at its tip, or more rounded, located on the mesopluron about on a line between the bases of the fore and the mesocoxae and just behind the episternal suture which is always long in those species which have this elevation. It appears to occur only in totally black, tropical or semitropical species and not in all of them. In some cases this area is only slightly raised above the general surface.

Pubescence on the mesopluron may be very general, but when limited to a band, this extends from the mesocoxal knob forward along the meso-metaplural suture to the base of the rectangle; along the hinder margin of this, also, or over the entire rectangle. Sometimes this band is broad; sometimes narrow, and sometimes it may broaden out forward, below the rectangle so as to become nearly a triangular area. It often grades into a less dense covering of sericeous hairs.

PETIOLE. In *Sphex* the petiole (Fig. 2) is composed of two slender segments, the first cylindrical and apparently consisting of but one plate closely rolled around the organs within. At its hinder end below, this plate broadens and flattens, becoming somewhat spear-shaped, and extends backward under about the front third of the second petiolar segment, to which this part does not seem to be closely joined. The first segment varies from straight to slightly arched downward, a character which has sometimes been used in descriptive work but which varies so much as to be unreliable.

The second segment is shorter than the first and its notum extends far down at the sides. Beneath, particularly toward its hinder end, a weakly chitinized sternum may be found. While this segment appears to be higher behind than the preceding one this is largely due to the prolongation downward of the sides of the notum. These sides often stand out from the segment somewhat, posteriorly, letting the light pass through and when this happens the color of this portion becomes lighter, apparently, than that of the rest of the plate. The spiracle on the sides of this segment is located at or behind the middle of the segment, while in *Podalonia* (*Psammophila* auct.) it is in the middle, or more usually in front of the middle.

ABDOMEN. The main bulk of the abdomen (Fig. 2) follows the petiole and consists of five evident segments in the female, and six above and seven below in the male. There is usually little in the way of characters on the abdomen of value in classification though a colored terminal segment behind black ones is sometimes of corroborative value.

WINGS. The Tegula, though not a part of the wing, but a plate lying over its base, may be referred to here. It varies in color with that of the insect, being lighter in light colored species. In dark or black insects it is usually black in front but somewhat lighter behind. It may be more or less sericeous or, rarely even partly pubescent. The wings themselves vary in color from deeply fuliginous to transparent, though in these last there is a tendency for them to be slightly darkened beyond the cells. Sometimes the wing membrane itself has a distinct color and often a bluish or violet reflection. The color of the veins ranges from black through various shades of brown and reddish to pale, almost honey yellow and this is useful in identification. Both recurrent veins join the second cubital cell, though the second may be nearly, or sometimes actually interstitial with the second transverse cubital vein. Their exact points of junction with the second cubital cell, though, are variable in the same species and cannot be relied upon in determinative work. The second cubital cell may be quite wide, or narrow, though the amount of width is variable, but in general, a wide cell as opposed to a narrow one may be of accessory use in determining specimens. The third cubital cell is also variable and cannot be depended upon for this purpose though some features about it are helpful at times. Thus, one with an evenly rounded hinder outer corner without a trace of the cubital vein beyond, is generally found in the tropical and semitropical species; a rather square cell not having a height much greater than its width is sometimes indicative of one species rather than of another and may be used as secondary evidence as to which species the insect is when other characteristics are doubtful. The evidence from the wing veins is only secondary, though, so while general form and relative sizes of some of the cells may be made use of as additional evidences of identity they should never be relied upon alone. Such statements as: First recurrent vein joining the second cubital cell nearer the second transverse cubital than the space on the radial vein between the second and third transverse

cubital veins; cannot be depended upon at all and should be ignored.

In the group *Coloptera* the third transverse cubital vein is often either partly or entirely absent and in such cases the cubital vein may be almost undeveloped beyond the outer back corner of the second cubital cell. In some cases, judging from the spacing, it is the second transverse cubital vein which is not developed, again resulting in the presence of only two closed cubital cells. The venation in this region may differ in the wings of the two sides in the same insect. In some cases the second and third transverse cubital veins may join the radial vein together, or (very rarely) unite before reaching the cubital vein producing a petiolated third cubital cell. This is so unusual, however, as to place such a case in the class of abnormal venation, at least for American species of *Sphex*.

The hind wings provide no distinctive characters for the separation of species as far as I have been able to observe.

Legs. The legs, on the whole, are rather slender, the hind pair the longest and the front pair the shortest. Pubescence is often present on the upper face of the coxae and frequently on the trochanters, also. All the segments are liable to be sericeous and the spines may differ in color from the segments they are on, often being slightly resinous on black legs, and darker than the leg on more ferruginous ones. In some species there is a minute tooth at the base of the claws of each leg in the female but none in the male. This tooth is very small and to find it, it may be necessary to remove and mount the claw. The tarsal comb, a fringe on the outer side of the fore metatarsus in the female, usually consists of about four or five long, rather stout spines on the outer side, but in some cases these are more numerous and like a fringe of long hairs. As the number of these "comb teeth" varies, and as some are at times shorter than others, they cannot be safely used for the separation of species. The pulvilli are well developed in both sexes in the species included here except in *Coloptera* where they are small.

SURFACE CHARACTERS.

These are generally very useful in identifying species. They are of two classes, *viz.;* markings on the surface of the skeleton; and the hairy clothing of the insect.

The markings may be ridges, striae, punctures, or a finer sculpturing, here called shagreen. The ridges or rugosities are always present on the propodeal disk; generally, also, on its end and sides; are often present on the scutellum, meso- and metaplura, and sometimes on the collar and mesonotum. They may be strong or weak, parallel, or irregular, and at times anastomose somewhat. Parallel rows of punctures with only slight spaces between, may produce the appearance of low ridges when these are not really present. Punctures between the ridges are of common occurrence.

Punctures vary in size, not only in different places on the body, but also to some extent in individuals of different sizes in the same species, being larger, of course, in the larger specimens. Ordinarily each is a simple pit from the bottom of which a hair arises, but sometimes they seem to be oblique to the surface of the plate, giving the margin an oval outline. The size of the hair growing out of the pit appears to be correlated with the size of the pit, though a large puncture does not always carry a long hair for these sometimes arise from small punctures. Smaller than the punctures is a minute sculpturing of the plates in many cases, so fine that its nature is difficult to make out. I call it Shagreen. Seemingly, where this condition is found, the surface is covered by a very fine layer of what appear to be extremely short, rather decumbent hairs. This condition I have called finely sericeous, or pruinose. Sometimes, though rather rarely, the surface may appear to be striated, as though scratched by a needle, rather than ridged. This is most likely to be found in the gutter in front of the prothoracic lobe.

The clothing of the body may be described as consisting of hairs, erect, or nearly so and longer than the other types—pilosity; shorter, decumbent hairs, closely packed together and forming pubescence in spots or bands, rarely covering more or

less of the entire body; shorter hairs, less closely packed, so that the surface of the body is less concealed—sericeous; and the finest, shortest hairs of all, arising from a shagreened surface, often, when of the proper color, suggesting the bloom of a ripe fruit. This type of covering may be termed pruinose. Pubescent, sericeous and pruinose coverings may, and often do, grade into one another.

As an insect becomes older the clothing wears off until in some cases little is left, and then, sometimes, it becomes difficult to determine the species and the fresh condition can only be judged from the punctures and shagreen, knowing that the missing hairs arose from them. Unfortunately, the punctures beneath pubescent and sericeous areas do not appear to differ greatly and it becomes difficult to decide whether any given place was originally the one or the other. For the erect hairs, though, the punctures can be used as indicators of the real condition with reasonable safety except as to whether they were long or short, which there seems to be no way of deciding unless a few still remain.

The method used to preserve the specimen also has a significance. It is at least probable that many of the specimens from the "Colorado Territory" which became Cresson's types were originally placed in alcohol and this has a distinct effect. A specimen removed from alcohol and pinned often fails to show the sericeous clothing at all and even the pubescence is sometimes lost except when the insect is held at just the proper angle of vision. Several of Cresson's types fail to show pubescence in certain places and were not described as having it there, but an examination at the right angle reveals it. This explains certain apparent differences between the original descriptions and the redescriptions. It is also possible that pruinosity having a reflection of a particular color may lose that in alcohol, thus misleading later students of these insects. Finally, it is certain that some individuals of a species may have such a reflection while in others it is entirely lacking.

SEX DISTINCTIONS.

In the females the front (inner) margins of the eyes in all American species are nearly parallel: the clypeus extends only a short distance below a line joining the lower margins of the eyes: the antenna is composed of twelve segments: the fore metatarsus bears a row or fringe of long spines or hairs on its outer side: the abdomen behind the petiole shows five segments and its tip is conical, often with a sting projecting.

In the males the front (inner) margins of the eyes converge downward and the eyes themselves seem to extend farther backward on the sides of the head: the clypeus extends some distance below a line joining the lower margins of the eyes: the antenna is composed of thirteen segments: the fore metatarsus has no row of long spines on its outer side: the abdomen behind the petiole shows six segments above and seven below and the tip itself is rather broad laterally instead of being conical. Males have a strong tendency to be darker than the females.

VARIATIONS.

SIZE. Variation in size in the same species may be very great in this genus. Perhaps the most striking example of this is in *Sphex procerus* where the average length of the body in the female is about thirty millimeters, but specimens twenty-one to thirty-eight millimeters long are known, while in the males where the average length is about twenty-five millimeters, specimens eighteen to thirty-five millimeters have been captured.

The cause or causes of such great variations may only be speculated upon. One explanation which may, perhaps, apply is an abundant as against a scanty supply of food provided by the parent wasp for its young and for this two explanations seem possible. One is that a scarcity of food gives an insufficient provisioning for the larva. This may result in the death of the young insect before it completes its transformations. But if barely enough food is available to permit the larva to reach maturity the resulting insect may be very small and, perhaps, aberrant in some ways. This view is supported to some extent

by the fact that abnormalities, particularly of venation, are most frequent in undersized individuals of the species. Another explanation having at least a theoretical possibility of being correct, is that the parent has been delayed in some way in completing its burrow which may have been unusually difficult to excavate, or it may have begun several before finding a satisfactory place and thus the necessity for immediate egg-laying appeared before the burrow had been sufficiently provisioned. An abundant food supply is easily seen to permit the development of at least average or larger individuals.

Color and Coloration. Colors in *Sphex* are black and ferruginous, but of various shades. Black is in most cases the basic color, but often, in some places where light can pass through a plate it seems, instead, to be a very dark brown. Thus, the sides of the notum of the second petiole segment do not always closely cover the segment, but project downward, particularly behind. This permits light to pass through the lower part of the plate near its hinder end and the black elsewhere, here becomes brown.

Ferruginous, though a general term for the other color, has a wide range of variation, not only in different species but in the same species from different localities. Thus, *Sphex aberti* from New Mexico and Arizona has a bright, pale color, nearly like ochraceous-tawny,* which, contrasting with the black and the rich, silvery white pubescence and hairs make this a beautiful insect. Going north into Colorado the ferruginous becomes darker, more nearly resembling the color of resin. This is retained farther north into the Dakotas, westward to the Pacific coast and southward into California. The amount of surface covered by this color varies, becoming less, northward, but increasing again, somewhat, going southward in California. Here, however, the color itself becomes somewhat darker and its area, while varying, is never as great as in Arizona, and in some localities (Panamint Valley and elsewhere) it is even almost entirely lost. The differences, both in the color and its distribution

*As shown by Ridgeway: Color Standards and Nomenclature, Plate xv, 1912.

are so great in this species that if I had not had a long series of these insects from nearly all parts of its habitat I probably would have considered them as including at least three species despite their structural agreement.

Somewhat similar conditions are met with in *Sphex breviceps* which in the form I have called *Sphex breviceps pruinosus* greatly resembles a tiny *aberti,* although the changes of color are not so great. Here the striking variations are in the area occupied by the color; by the gradual loss of pubescence, and by a great increase in abundance of the long, erect hairs in northern specimens. These variations, working together, so greatly change the appearance of the species in the north from that in the south as to seem to make the recognition of two varieties necessary, though in some localities the two are found nearly together.

Variation in pubescence and pilosity has already been referred to. Pubescence, while generally white or silvery, often has a golden tinge and in some species it is entirely golden. The sericeous and pruinose clothing of some or all parts of the body may be black, bluish, or like the pubescence.

In general, variation in color distribution appears to be closely related to climate, the ferruginous occupying a much larger portion in arid than in humid districts. This has already been discussed for *Sphex procerus** and it also holds for many other species though there appear to be some exceptions to this. The general color variation in *Sphex aberti* has already been described. Just why this species should nearly, and in some cases entirely, lose its ferruginous in the Panamint Valley, California, and in some other localities is not explained by this view as these regions are dry, and where normally one would expect to find the greatest amount of ferruginous.

Variations due to age and wear often cause difficulties (those in connection with the hairs have already been referred to). A change in the outline of the clypeal margin in the female, probably connected with digging the burrows, may cause the teeth

*Ann. Ent. Soc. Amer., vol. 19, p. 88, 1926.

to disappear and the edge in general to become badly worn. The condition of the mandibles is often an evidence of the age of the insect as they are sometimes worn down to mere stubs. When this is the case reduced pilosity, pubescence, etc., and a modified clypeal margin may generally be expected.

METHODS

The pilosity and pubescence so abundant on many of these insects often makes it difficult to see some of the characters needed for identification. This is particularly true with the clypeal margin, around the episternal suture and sometimes on the collar and in the gutter. I have found that these obscuring structures may be most easily removed by grinding the point of a needle to form a slightly oblique, sharp edge and with this scraping the place where a better view is desired, thus removing whatever may be in the way. Views of the clypeal margin from behind are almost impossible when the mandibles are closed and are liable to be deceptive when they are open, and denuding one side only, in front, may also give mistaken ideas as to the outline. I have, therefore, found it best to denude the entire front margin. To give proper rigidity to the specimen while this is being done I pin it to a cork L and support the head end of the pin on another which has been so bent as to form a shoulder.

For a long time I believed the outline of the last ventral abdominal segment of the male would provide a satisfactory character for use in identification, but after preparing a large number of mounts from apparently allied species I have been obliged to discard this view, the outline being too variable. I have also found the genitalia of far less value than Cameron appears to have believed, for while in some instances they are different, in others they are of no assistance whatever.

In my studies I have made use of a Spencer Binocular microscope with the paired 2.3× objectives and the 9× oculars in most cases, occasionally turning to higher powers.

CLASSIFICATION

Almost any textbook on Entomology containing analytical keys will enable one to place insects of the genus *Sphex* and related genera in the Family Sphecidae. In Comstock's Introduction to Entomology, First Complete Edition, 1924, page 963, a key to the subfamilies and some of the tribes is also given, though all are there marked as tribes. The Sphecini of that key, however, is really the subfamily Sphecinae, as is shown on page 966 of that book and the tribes of the Sphecinae are not given. Therefore, when one has traced an insect by that key to the "Sphecini" he is ready to turn to the key below to the tribes of the Subfamily Sphecinae.

Analytical Key to Tribes.*

1. Second cubital cell receiving only the first recurrent vein; the third cell receiving the second recurrent. (Not true of some extra-limital species.) 2

   Second cubital cell receiving both recurrent veins, or the second recurrent vein interstitial with the second transverse cubital vein. Sometimes the first recurrent vein is interstitial with the first transverse cubital vein, or received by the first cubital cell..... 3

2. Antennae inserted at the middle of the face; claws with one to six teeth near the base; tibiae spinous; tarsal comb present in the female except in the subgenus *Isodontia* ..... *Chlorionini* (*Sphecinae* auct.).

   Antennae inserted below the middle of the face; claws without teeth or with one tooth near its middle; tibiae not spinous; tarsal comb absent in the female ..... *Podiini.*

3. Abdomen more or less elongate; petiole of one or two segments; tibiae more or less spinous; tarsal comb present in female; cubital vein of hind wing usually

*Modified from a similar key in Proc. U. S. Nat. Museum, vol. 71, p. 9, 1927.

originating beyond the transverse median vein; claws usually without teeth in American forms; when present they are basal and small ..... *Sphecini* (*Ammophilini* auct.).

Petiole of one segment; cubital vein of hind wing interstitial with transverse median vein or nearly so; tarsal comb of female absent 4

4. Antennae inserted at the middle of the face; propodeal disk U-shaped; mesopluron not longer than the height of the thorax ..... *Sceliphronini.*

Antennae inserted far below the middle of the face, on, or just above an imaginary line drawn between the bases of the eyes; proprodeal disk not U-shaped; mesopluron much longer than the height of the thorax ..... *Podiini.*

A paper covering the Chlorionini of North America was published by me in Proceedings of the U. S. National Museum, vol. 31, p. 291, 1906. Of the two genera of the Sphecini, one of the genus *Podalonia* (*Psammophila* auct.) was published by me in the Proceedings, vol. 71, Article 9, 1927, and the other—on *Sphex,* the remaining genus—is presented here. Of the Sceliphronini one of its two genera, *Sceliphron,* has been the subject of a paper by Dr. B. A. Porter, also published in the Proceedings, vol. 70, p. 1, 1926, and the other, *Chalybion,* was treated by Dr. J. C. Hutson in Transactions of the American Entomological Society, vol. 45, p. 203, 1919, though unfortunately, through an oversight as to the designation of a genotype, for which I assume all responsibility, this paper is entitled "The North American Species of the Genus Sceliphron" instead of *Chalybion.* In the Podiini no American systematic paper has yet appeared and for the identification of its genera and species one must refer to Kohl's paper "Monographie der Neotropischen Gattung Podium" published in Abh. k. k. Zool.-Bot. Gesselsch. Wien, Band I, Heft 4, 1902. Although only two or three species of this tribe are found in the United States, tropical America has quite a number and the group is awaiting revision.

The species of Sphex vary much in different parts of the world and seven genera or subgenera have been proposed by different workers on these insects. Kohl, however, considers them all as but "species groups." Personally, I am not prepared to accept either the "species group" idea in full, or the numerous genera which have been suggested, and consider that in North America, at least, only two different genera are represented: *Podalonia* and *Sphex;* and that but two species groups occur in this country under the genus *Sphex*. Whether other workers may consider these as of subgeneric value will depend on the standards held by those who study the group.

Analytical Key to Genera.

1. Petiole consisting of one segment, its dorsal plate quite broad and more or less bell-shaped; spiracle on this plate in front of, or at least not behind the middle; teeth on the hind tibial spine in the female rather stout, not crowded. Podalonia (*Psammophila* auct.).

   Petiole consisting of two segments, the second not much stouter than the first; its spiracle at or behind the middle; teeth on the hind tibial spine in the female closely packed together; rather slender insects in most cases.....Sphex (*Ammophila* auct.).

In *Sphex* Kohl includes as a "species group" the insects here placed under *Podalonia* (*Psammophila* auct.). Of the other groups four have also received generic names and Kohl preserves these as the names of those species groups.

Parapsammophila Tasch. has bidentate claws and as no *Sphex* has thus far been found in this country with this character (see comment on *S. nigropilosus* Roh., p. 62) this group may be omitted from further consideration here.

Eremochares Grib. was erected in part on the presence of a single tooth at the base of the claw. There are a few American species which possess this tooth, but only in the female and the other characters of these species fail to agree with those of

Eremochares. I am of the opinion, therefore, that the species group *Eremochares* is not represented in North America.

Coloptera was established by Lepeletier for his species *barbara*, solely on the basis that the fore wing possesses only two cubital cells. Whether this character always holds good for *barbara* I do not know, but in North America specimens of *Coloptera wrightii* frequently show three cubital cells in each wing or two in one wing and three in the other. Kohl seems to have realized that this character alone would hardly justify the preservation of the group for he revises its definition by adding others. These are: Episternal suture of the mesopluron indistinct; posterior tarsi of the male somewhat thickened. In these regards *wrightii* agrees with his definition of *Coloptera* which, therefore, may be retained as represented in this country.

The species group *Miscus*, erected by Jurine, based on the presence of a petiolated third cubital cell, does not seem to be represented in North America. Almost any species of *Sphex*, however, particularly if small and a male, may show venational variations and among these a petiolated third cubital cell is not unknown. In some cases this condition may be found in one wing while the other is normally veined. Whether it is a fixed character in some of the Old World species, as Kohl's descriptions seem to imply, I am unable to say, but I feel certain that in this country, at least, a *Miscus*-veined specimen is merely an abnormality.

The other "species groups" given by Kohl are "Species group of *armata;*" "Species group of *fallax;*" "Species group of *gracillima;*" "Species group of *clavus*" and "Species group Ammophila," the *Sphex* proper of this paper. Of these, North America appears, thus far, to have only representatives of the last.

Rohwer has established the subgenus *Ceratosphex* from the Philippine Islands. As it has two teeth on each claw it may also be omitted from the American list, leaving *Coloptera*, *Sphex* proper and the single toothed species which do not agree in other regards with *Eremochares* as the species groups to consider, and as these last are *Sphex* in the strict sense in every way except

for the toothed claws, they come nearer to it than to *Eremochares*. We must, therefore, either place these toothed species in a new species group or put them into *Sphex* proper. I prefer to do the latter, thus giving us two groups, *Coloptera* and *Sphex* (sens str.) only, to deal with.

Analytical Key to Species.

With such variable species as are many of these it has seemed almost impossible to provide for all the existing variations in this key. When there is any doubt as to the species, therefore, after using the key, it will be desirable to compare the specimen with the complete descriptions of those which seem most likely to be the right one.

1. Mesoepisternal suture very indistinct or even apparently absent; very small insects. — Group Coloptera. ..... *Sphex* (*Coloptera*) *wrightii* (Cress.) (p. 38).
   Mesoepisternal suture evident; generally larger insects.... 2
2. Females 3
   Males 41

Females

3. Collar quite long, transversely ridged..... 4
   Collar quite long, smooth; mesonotum transversely ridged; legs ferruginous ..... *novitus* n. sp. (p. 147).
   Collar not long; of various forms..... 8
4. Ground color of body brownish to ferruginous; collar only slightly higher than neck..... ..... *ferruginosus* (Cress.) (p. 41).
   Ground color of body black..... 5
5. Legs entirely black or piceous..... 6
   Legs at least partly ferruginous .... *parapolitus* n. sp. (p. 51).
6. With strong meso- and metaplural pubescent bands; not sericeous; generally medium to large insects..... ..... *procerus* (Dahlb.) (p. 44).

Meso- and metaplural pubescent bands not strongly defined, sometimes incomplete in front; plura whitish sericeous; small to medium sized insects..... 7

7. First petiole segment black or piceous; last three abdominal segments black, at least above..... ..... *politus* (Cress.) (p. 49).

First petiole segment usually ferruginous; abdomen with shades or spots of black only..... ..... *parapolitus* n. sp. (p. 51).

8. Collar transversely ridged..... 9

Collar not transversely ridged..... 10

9. Legs black ..... *politus* (Cress.) (p. 49).

Legs more or less ferruginous ..... *parapolitus* n. sp. (p. 51).

10. Propodeal side ridges running strongly forward..... 11

Propodeal side ridges running only slightly or not at all forward, or absent 15

11. Legs more or less ferruginous; thorax dull black but with considerable pubescence .... *volcanicus* (Cam.) (p. 54).

Legs black; thorax more or less pubescent; wing veins yellow or reddish yellow..... 12

12. Plura with pubescent bands..... 13

Plura without pubescent bands..... 14

13. Plura with almost no sericeous; pubescent bands sharply defined ..... *volcanicus* (Cam.) (p. 54).

Plura with more or less sericeous, grading into the pubescence ..... *guerinii guerinii* (D. T.) (p. 57).

SEE ERRATA

14. Thorax dull black; wing veins yellow or yellowish ..... *guerinii placidus* (Sm.) (p. 59).

SEE ERRATA

Thorax dull black; wings rather fuliginous, veins brown ..... *guerinii extremitatus* (Cress.) (p. 62).

SEE ERRATA

15. Wings dark yellow; thorax with almost no pubescence; propodeal side ridges almost vertical, more or less broken; rather large insects..... ..... *xanthopterus* (Cam.) (p. 63).

Wings not dark yellow; propodeal side ridges when present, of various types..... 16

16. Wing veins light yellow, often darker outwardly; heavily silvery pubescent and pilose; legs black; medium sized insects ..... *harti* Fern. (p. 88).
    Wing veins not light yellow..... 17
17. Episternal suture with a backward notch forming a wide horizontal V..... 18
    Episternal suture without such a notch; running straight downward or only slightly curved..... 20
18. Mesonotum more or less definitely ridged..... ..... *aureonotatus* (Cam.) (p. 65).
    Mesonotum punctured, only..... 19
19. Mesopluron gradually projecting laterally in front, below, to form a conical projection with a rounded top ..... *miliaris* (Cam.) (p. 71).
    Mesopluron projecting gradually at first, then abruptly, forming a rounded terminal projection quite distinct from the more basal part .... *opulentus* (Guer.) (p. 69).
20. Episternal suture extending little if any below the prothoracic lobe 21
    Episternal suture extending far below the prothoracic lobe 30
21. Body heavily, coarsely, quite evenly and generally pubescent on the sides; not very pilose..... 22
    Body only somewhat pubescent; in bands..... 23
22. Scutellum longitudinally ridged; legs black..... ..... *junceus* (Cress.) (p. 129).
    Scutellum almost without ridges; legs partly ferruginous ..... *aberti* (Hald.) (p. 80).
23. Body often densely gray pilose; abdomen black or only tinged with ferruginous on the first segment..... ..... *aberti* (Hald.) (p. 80).
    Body pilose or not; front part of abdomen ferruginous.... 24
24. Body quite pilose; metaplural pubescent band slightly, or not developed ..... *arvensis* group (p. 117).
    Body not very to not at all pilose..... 25

25. Mesoplural pubescent band quite broad, extending over part or all of the mesoplural rectangle..... 26
Mesoplural pubescent band narrow; rarely present at all on the rectangle ..... *arvensis* group (p. 117).

26. Metaplural pubescent band hardly ever crossing onto propodeal side; often absent. Mexico and Central America ..... *fragilis* (Sm.) (p. 114).
Metaplural pubescent band crossing onto propodeal side; sometimes absent. U. S.: Mexico..... 27

27. Body more or less mottled with spots of dull ferruginous ..... *arvensis* group (p. 117).
Body entirely black..... 28

28. Clypeus strongly swollen, its margin wide and projecting strongly between the quite close teeth; first petiole segment generally ferruginous (Fig. 11)..... ..... *chiriquensis* (Cam.) (p. 135).
Clypeus not much swollen, its margin neither wide nor projecting much between widely separated teeth; first petiole segment black (ever ferruginous?)..... ..... *junceus* (Cress.) (p. 129).

29. Body, petiole and abdomen entirely black, often with a bluish or greenish reflection....*gaumeri* (Cam.) (p. 111).
Abdomen and part of petiole, at least, with some ferruginous 30

30. Clypeal margin without teeth; with a broad, flat, rather evenly rounded rim below the pubescence (Fig. 12) ..... *craspedotus* n. sp. (p. 96).
Clypeal margin not evenly rounded nor greatly developed; its two teeth one-fourth to one-third the length of the margin apart..... 31

31. Scutellum wholly or partly without ridges..... 32
Scutellum longitudinally ridged..... 38

32. Body black pilose..... 33
Body white pilose..... 34

33. Usually without pubescence or only traces of it. Northern ..... *nigricans* (Dahlb.) (p. 98).

With mesoplural pubescence (sometimes only sericeous) forming almost a triangle instead of a band. Southern ..... *consors* (Cam.) (p. 101).

34. Head black pilose 35
Head white pilose..... 37

35. Plura slightly sericeous, not pubescent.....
..... *trichiosomus* (Cam.) (p. 105).
Plura with more or less definite pubescent bands..... 36

36. Thorax strongly white pilose; pubescence white .....
..... *strenuus* (Cress.) (p. 136).
Thorax with few, white, short, scattered hairs; pubescence tending to golden ..... *willistoni* n. sp. (p. 91).

37. Legs partly ferruginous*..... 38
Legs black, rarely somewhat piceous.....
..... *aculeatus* n. sp. (p. 144).

38 Plura quite strongly sericeous to pubescent, almost or wholly concealing the pubescent bands; not very pilose ..... *breviceps pruinosus* (Cress.) (p. 87).
Plura less strongly sericeous, not concealing the bands; quite densely pilose....*breviceps breviceps* (Sm.) (p. 84).

39. Legs partly ferrugineous; body densely pilose.....
..... *breviceps breviceps* (Sm.) (p. 84).
Legs black; tarsi sometimes piceous..... 40

40.† Plura and propodeal sides almost entirely, though finely, sericeous; generally larger, slimmer insects than the next ..... *aculeatus* n. sp. (p. 144).
Plura and propodeal sides little if at all sericeous; generally smaller insects than the last .....
..... *arvensis* group (p. 117).

Males

41. Episternal suture with a backward notch forming a wide, horizontal V 42

**Breviceps* with black legs are not provided for here; see descriptions.
†A difficult distinction: consult descriptions.

Episternal suture running downward, either straight or slightly curved 44

42. Mesopluron with no lateral projection in front, below ..... *aureonotatus* (Cam.) (p. 65).
Mesopluron with more or less of such a projection, or at least swollen there 43

43. Mesopluron with a prominent lateral projection ending in a rounded knob ..... *opulentus* (Guer.) (p. 69).
Mesopluron with only a slight swelling and no defined top ..... *melanarius* (Dahlb.) (p. 74).

44. Episternal suture extending only to, or slightly below the prothoracic lobe 45
Episternal suture extending well down to the underside of the body (its lower part may be almost obsolete in some cases) 58

45. Collar long, broad, rather flat above, rising more or less sharply from the neck; often also turning back at a rather sharp angle 46
Collar shorter, not flat above, not turning back at a sharp angle 49

46. Collar smooth above ..... *novitus* n. sp. (p. 147).
Collar transversely ridged above 47

47. Body black and ferruginous; legs ferruginous; small insects ..... *ferruginosus* (Cress.) (p. 41).
Body entirely black 48

48. Plura not sericeous; mesoplural pubescent band evident; metaplural band often short, *procerus* (Dahlb.) (p. 44).
Plura weakly but quite evenly sericeous; pubescent bands weak or absent ..... *parapolitus* n. sp. (p. 51).

49. Clypeal margin truncate and sometimes faintly emarginate medially, also 50
Clypeal margin not having this outline 51

50. Clypeal margin rounding quite evenly toward the eye on its outer third; legs generally partly ferruginous (Fig. 3) ..... *aberti* (Hald.) (p. 80).

Clypeal margin extending far out before turning rather sharply upward; legs black or piceous (Fig. 18) ..... *transversus* n. sp. (p. 141).

51. Mesonotum more or less transversely ridged..... 52
Mesonotum not transversely ridged anywhere..... 54

52. Mesonotum with a definite pubescent band; metaplural band less developed 53
Plura without definite pubescent bands but generally very sparsely sericeous ..... *parapolitus* n. sp. (p. 51).

53. Wings fuliginous ..... *arvensis* group (p. 117).
Wings nearly or entirely hyaline, *junceus* (Cress.) (p. 129).

54. Mesoplural pubescent band not extending over the rectangle ..... *cora* (Cam.) (p. 107).
Mesoplural pubescent band present on part or all of the rectangle 55

55. Clypeal emargination rounded at each end..... 56
Clypeal emargination with a tooth or at least a point at each end 57

56. Body entirely black. Mexico and Central America (Fig. 6) ..... *fragilis* (Sm.) (p. 114).
Body with dull ferruginous shades or spots on prothoracic lobe and sometimes elsewhere..... ..... *arvensis* group (p. 117).

57. Mesoplural pubescent band heavy, sharply outlined; metaplural band distinctly crossing onto the propodeal side ..... *junceus* (Cress.) (p. 129).
Mesoplural pubescent band generally grading into sericeous in front; metaplural band weakly developed but traces may show on the propodeal side..... ..... *arvensis* group (p. 117).

58. Collar finely transversely ridged. Small insects..... ..... *politus* (Cress.) (p. 49).
Collar smooth or with faint traces of ridges in front, only 59

59. Lower margin of clypeus prolonged into a median point ..... *nasalis* (Prov.) (p. 77).
Lower margin not thus prolonged..... 60

60. Collar quite long, rising sharply from the neck, then turning quite sharply backward .... *acutus* n. sp. (p. 150).
Collar not turning back sharply..... 61

61. Body well clothed with black hairs everywhere..... 62
Body not clothed with black hairs 68

62. Sides of propodeum punctured; almost or entirely without ridges ..... *centralis* (Cam.) (p. 109).
Sides of propodeum punctured, but also with ridges..... 63

63. Ridges on propodeal sides running strongly forward. ..... *volcanicus* (Cam.) (p. 54).
Ridges not running strongly forward; generally concealed under a dull black, sericeous covering..... 64

64. Body quite strongly silvery sericeous.....
SEE ERRATA ..... *guerinii guerinii* (D. T.) (p. 57).
Body not strongly if at all sericeous 65

65. Wings more or less strongly tinged with yellow; body
SEE ERRATA usually dull black ..... *guerinii placidus* (Sm.) (p. 59).
Wings more or less fuliginous 66

66. Wings somewhat fuliginous; body usually dull black
SEE ERRATA .....*guerinii extremitatus* (Cress.) (p. 62).
Wings strongly fuliginous; body rather shining 67

67. Rather large insects, not sericeous; generally with pubescence only beside the petiole if at all. Northern. ..... *nigricans* (Dahlb.) (p. 98).
Averaging smaller; generally with pubescence beside the petiole and a trace of sericeous on the mesoplural rectangle and sometimes elsewhere. Southern..... ..... *consors* (Cam.) (p. 101).

68. Body slightly white pilose 69
Body quite densely white pilose 71

69. Propodeal side ridges running strongly forward..... ..... *volcanicus* (Cam.) (p. 54).
Propodeal side ridges not running forward 70

70. Scutellum longitudinally ridged .... *arvensis* group (p. 117).
Scutellum almost or entirely smooth, *peckhami* n. sp. (p. 93).
71. Head pilosity white 72
Head pilosity black 77
72. Body not uniformly much sericeous 73
Body quite to very sericeous (if weakly so, at least very uniformly so on plura and propodeal side)..... 74
73. Legs partly ferruginous *breviceps breviceps* (Sm.) (p. 84).
Legs black; tarsi sometimes slightly piceous .....
..... *arvensis* group (p. 117).
74. Scutellum longitudinally ridged .... *aculeatus* n. sp. (p. 141).
Scutellum not ridged; nearly or wholly smooth or punctured 75
75. Legs black; first petiole segment black....*harti* Fern. (p. 88).
Legs partly ferruginous; first petiole segment black or ferruginous 76
76. Body pilosity much more evident than the sericeous or pubescence ..... *breviceps breviceps* (Sm.) (p. 84).
Body pilosity less evident than the sericeous or pubescence ..... *breviceps pruinosus* (Cress.) (p. 87).
77. Scutellum rather strongly ridged, *arvensis* group (p. 117).
Scutellum nearly or entirely without ridges 78
78. Clypeal margin with a rather deep central excavation, ending at each side in a marked projection. (Fig. 5) ..... *dubius* n. sp. (p. 139).
Clypeal margin rounded, with a broad, shallow, central emargination which is rounded at each end. ..... *trichiosomus* (Cam.) (p. 105).

DESCRIPTIONS OF SPECIES.

These descriptions may seem unduly long. For several years I have tried to find a few characters which of themselves would be sufficient to separate the species, but have not succeeded. This has seemed to make it necessary to provide quite complete descriptions in order that results obtained by the use of the Analytical Key may be checked by fuller details. Even color

and its distribution has been given, as this, sometimes, despite its variations, gives corroborative eveidence as to the species.

Species group Coloptera.

1. **Sphex (Coloptera) wrightii** (Cresson).

Coloptera wrightii Cresson, 1868, Trans. Am. Ent. Soc., vol. 1, p. 378, female.
Coloptera wrightii Melander, 1903, Psyche, vol. 10, pp. 162, 164.
Coloptera wrightii H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 328.
Coloptera wrightii Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 400.
Sphex wrightii Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449.

Ferruginous, but often spotted or shaded with black here and there; with more or less silvery pubescence, chiefly on the sides of the thorax. Petiole nearly as long as head and thorax together, longer than hind coxa, trochanter, and tibia together, its segments about equally long. Wings nearly hyaline. Episternal suture faint; sometimes apparently absent. Our smallest species.

Female.—*Head* almost circular from in front except on its lower margin, high above the eyes medially; almost without punctures, those present small; its surface almost or entirely unclothed except for long, slender, pale ferruginous hairs on the cheeks and a very few on the clypeus: clypeus somewhat swollen centrally, the central third of its lower margin rounded and with a median emargination; median indented line on frons evident, forking at the front ocellus; behind the ocelli a transverse indented line present, completes the ocellar area but the lines extend back beyond this a short distance; ocellar area often black: mandibles ferruginous out to the teeth, darker beyond.

Thorax: Collar long, low, rising gradually from the neck, narrowing above behind the middle which gives the top an oval to circular outline, though lower down, behind, it retains its width; upper surface of neck and collar finely transverse ridged, the ridges very faint or not evident on its sides; lateral indented line distinct nearly all the way around the side and extending almost to the base of the prothoracic lobe: gutter absent: prothoracic lobe pubescent or heavily sericeous. Mesonotum rather high above the collar, transversely ridged except that posteriorly the ridges are more oblique. Scutellum sometimes slightly two-humped, finely ridged longitudinally. Post-scutellum high medially, with a median depression; ridged longitudinally more or less. Propodeal disk rather flat, the front ridges running obliquely outward from its front margin; behind that, from

the median line outward and from about opposite the spiracles crossing the middle and nearly transverse across the plate; posteriorly they may even bend slightly forward near their ends; end transversely ridged and often with a black spot; silvery pubescence on each side of the petiole; sides with the ridges continued from the end, downward and curved backward somewhat, posteriorly, but further forward curving sharply forward, the triangular area thus left along the propodeo-metaplural suture near the middle, confused or with short, vertical ridges to fill this space. Metapluron with fine ridges along its upper margin; those behind nearly vertical and those in front running strongly backward and downward. Mesopluron with few, if any, ridges, but liable to be heavily sericeous or pubescent.

Petiole: Long, the first segment somewhat arched downward: spiracle of the second segment far behind the middle.

Abdomen: Short and rather stout, liable to be more or less tinged with dark or even with black.

Wings: Nearly hyaline, slightly iridescent at some angles; veins rather dark ferruginous. Radial cell a little short for its depth. Cubital cells most often lacking a complete third cubital though portions of it remain; sometimes complete on one side and incomplete on the other. Tegulae ferruginous, generally darker than the adjacent plates.

Legs: Ferruginous; coxae generally sericeous to pubescent above; fore legs with many long, pale, ferruginous hairs; tips of tarsal segments and tarsal spines usually darker than the rest of the tarsus. Pulvilli extremely small.

MALE.—Hardly differing enough from the female to need a description. The following points, though, may be mentioned:

Slightly more, though scantily pubescent, particularly on the sides of the thorax; there is a tendency to more dark areas here and there on the body; the hind tarsal segments are stouter than those of the other legs; the clypeus extends a little farther down than in the female; and the insect averages smaller.

LENGTH.—Females, 10—13 mm.; Males, 9—12 mm. About 25 specimens studied.

DISTRIBUTION.—Texas, New Mexico, Arizona, "Los Angeles Co., Cal." and Colorado are the localities from which I have seen specimens. One female in the Baker collection in the U. S. National Museum, marked "Pa. 2045" is certainly erroneously labelled.

TYPES.—The type of this species is Type No. 1935, from New Mexico in the collection of the American Entomological Society

at Philadelphia. The male was studied from three specimens; the Allotype from San Diego, Tex., in my own collection; a parallotype from New Mexico, in the U. S. National Museum collection; and a parallotype from Arizona, in the American Entomological Society collection.

Dates of capture are April 19, June 21, July 8 and Aug. 16 in Texas; April 29 and Sept. 17 in New Mexico; and July 12 in Arizona. This would suggest the probability of two generations a season in Texas and New Mexico, at least. Unfortunately, few of the specimens seen bear dates of capture.

VARIATIONS.—The chief variations in this species are those of color and venation. The amount of dark, even black sometimes, ranges from almost entirely none to large areas. The abdomen is liable to be cross-streaked with dark above and sometimes below. Dark to black areas may be present on the sides of the thorax and the pectus behind the fore legs may be black. There seems to be no regularity in the distribution of the darker areas, though, except that the ocellar area is black when other dark markings are present.

Variation in wing venation appears to be mainly in the degree of completion of the third cubital cell. Of course the vein forming the front boundary of this cell is always present, being a part of the hind boundary of the radial cell, which is always complete. The development of the cubital vein forming the hind boundary of the third cubital cell, varies greatly. In some specimens it is complete, the third transverse cubital vein is complete, giving three entire cells, and the cubital vein extends out slightly beyond the cell toward the apex of the wing. On the other hand it may be present only to a point slightly beyond where it is joined by the second transverse cubital. Of the transverse cubital veins, themselves, the third may be entirely absent; a stub forward from the cubital or backward from the radial, or both, but the two not meeting. The second transverse cubital may be complete, or only a stub from the radial, or from the cubital. The first transverse cubital, though usually complete, is sometimes absent. In Cresson's type the first and second cubital cells are

complete in the right wing, and the third is almost so, only a short space being left open between the tips of the stubs of the third transverse cubital vein from the radial and cubital veins. In the left wing, though, only a slight stub of the cubital is present beyond the second transverse cubital and there is no trace of a third.

This species is easily recognizable by its small size and color and by the faintnes of its episternal suture which in some cases I have been unable to see even traces of. It most closely resembles *S. ferruginosus* but the latter is larger; the episternal suture is evident, and the three cubital cells are complete in all the specimens I have seen. In the male the clypeal outline also frequently differs somewhat from that in *S. wrightii,* the central third being emarginate in the former, while it is either nearly straight or even curved slightly downward, and with a weak central notch in the latter.

I must withdraw a statement published in Annals of the Entomological Society of America, vol. 24, pp. 449-450, 1931, that I could find no difference, and no reason for separating *wrightii* and *ferruginosus.*

SPECIES GROUP SPHEX (sens. str.)

Species 2-5. Collar transversely ridged.

2. **Sphex ferruginosus** (Cresson). (Fig. 20.)

**Ammophila ferruginosa* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 455, female.

**Ammophila collaris* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 456, male. (nom. preocc.).

Ammophila ferruginosa Melander, 1903, Psyche, vol. 10, p. 159, female.

Ammophila collaris Melander, 1903, Psyche, vol. 10, p. 159, male.

Sphex ferruginosus H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 329, female.

Sphex cressoni H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 329, male (new name for *collaris*).

Sphex ferruginosus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 403, female.

Sphex cressoni Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 404, male.

Sphex ferruginosus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449.

Ferruginous, but mingled with varying amounts of black, much more in the male. Episternal suture short. Collar and at least the front of the mesonotum finely transversely ridged. Head and thorax more or less covered with fine, white, sericeous hairs which on the prothoracic lobe, beside the petiole and on the middle and hind coxae above, become pubescent areas. Pilosity scanty, consisting of long ,white hairs. Wings hyaline, veins ferruginous. Antennae mainly ferruginous but with some black. A small species.

FEMALE.—*Head* broad, quite depressed near the antennal fossa. Clypeus quite flat, only slightly swollen in its middle, bearing a few punctures; its lower margin slightly emarginate medially, then running outward some distance on each side to a tiny tooth. Cheeks with a row of long, white, erect hairs from the occiput down to the mandibular articulations. Ocelli enclosed by depressed lines. Mandibles ferruginous, with black tips. Antennal scape and pedicel ferruginous, the latter often darker; filament ferruginous, often darker outwardly, sometimes entirely black.

Thorax: Neck short. Collar long, rising gradually and only very slightly from the neck; broad, but not as broad as its lower part near the fore coxae; lateral indented line bending somewhat inward at first, then outward, then backward and becoming obsolete some distance in front of the base of the prothoracic lobe; sides of the collar almost flat, showing no gutter, its surface more or less finely ridged. Mesonotum, Scutellum and Postscutellum finely ridged, the former transversely, the latter two longitudinally. Propodeal disk finely ridged, obliquely so in front, transversely behind; propodeal sides similarly closely, finely ridged, nearly vertically behind, but bending forward, toward the front. Metapluron similarly ridged, almost vertically behind, but the ridges in front run backward nearly parallel to the upper margin of the plate for a time, then bend sharply downward. Mesopluron horizontally ridged above but more irregularly so below; episternal suture evident; sometimes its lower end, or a branch, appears to turn backward and mark a part of the lower limit of the mesoplural rectangle.

Petiole: Usually entirely ferruginous, its first segment slightly curved.

Abdomen: Short, stout, ferruginous, often irregularly varied with black or dark shades.

Wings: Hyaline, though generally faintly fuliginous toward their tips; second and third cubital cells very variable in form. Tegulae ferruginous.

Legs: Ferruginous, often varied with black; coxae more or less sericeous to pubescent; metatarsal comb composed of long, slender, hair-like

spines on the side of the segment besides the stouter ones on the end; claws ferruginous.

MALE.—Very similar but rather smaller and with much more black everywhere. Clypeus white pubescent, its lower margin broadly, shallowly emarginate on its median third, lateral to which it runs upward, curving slightly, to below the eye. Thorax liable to be entirely black but often with ferruginous areas. Petiole ferruginous (ever black?). Abdomen ferruginous except for the last two or three segments which are black. Legs varying in color, but the tarsi are generally dark, even when the other segments are ferruginous. Pulvilli well developed.

LENGTH.—Females, 12-21 mm.; Males, 10-18 mm. About 50 specimens studied.

Distribution.—I have seen specimens from Anoka Co., Minn., Mott and Steele, North Dakota; Montana; Halsey, Nebraska; Morton and Hamilton Co's., Kansas; Trinidad and Roggen, Colorado; Neeucest, San Diego and Carrizo Springs, Texas; Mesilla Park, Las Cruces, Las Vegas and Gallup, New Mexico; Florence and Holbrook, Ariz.; and Claremont, California, besides less definitely located examples from most of these States. It has been captured in Texas in April and June; in New Mexico and Arizona in May and June; in Kansas in June; in Nebraska in July, August and September; in Minnesota, July 24th; and in Colorado in July and September. It was taken on *Dithyria wischireri* May 7th in New Mexico (Cockerell) and on *Malvastrum coccineum* July 7th in North Dakota (O. A. Stevens).

TYPES.—*Ferruginosus* was described from four specimens from "Colorado Territory," one of which was later selected by Cresson as the type (No. 1932-1). Collaris was described from a single specimen from the same locality (Type No. 1934). Both are in the collection of the American Entomological Society at Philadelphia.

No conclusive proof that *collaris* is the male of *ferruginosus* is yet available. But their agreement in distribution, their great similarity in structure, coloration and size, and the failure of years of collecting in those localities to find a species more likely to be the real mate of either, makes the assumption of their identity practically a certainty.

As the name *Sphex collaris* has already been used (a *Sphex collaris* was described by Linne in 1767), the transfer of Cresson's *Ammophila collaris* to the genus *Sphex* necessitated the

change of name and this was made by H. S. Smith, who renamed the insect *cressoni* in 1908.

3. **Sphex procerus** (Dahlbom). (Fig. 21.)

**Ammophila procera* Dahlbom, 1843, Hym. Eur., vol. 1, p. 15.
Ammophila procera Dahlbom, 1845, Hym. Eur., vol. 1, p. 430.
**Ammophila Gryphus* F. Smith, 1856, Cat. Hym. Brit. Mus., vol. 4, p. 222, female, male.
**Ammophila sacva* F. Smith, 1856, Cat. Hym. Brit. Mus., vol. 4, p. 222, female.
**Ammophila conditor* F. Smith, 1856, Cat. Hym. Brit. Mus., vol. 4, p. 223, female.
Ammophila Gryphus Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 459, female.
**Ammophila macra* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 460, male.
Ammophila procera Taschenberg, 1869, Zeits. f. d. ges. Naturw., vol. 34, p. 434, male, female.
?*Ammophila barbata* F. Smith, 1873, Ann. & Mag. N. H., (4) vol. 12, p. 260, female.
Ammophila gryphus Provancher, 1882, Natur. Canad., vol. 13, p. 14, female.
Ammophila conditor Provancher, 1882, Natur. Canad., vol. 13, p. 15, male.
Ammophila gryphus Provancher, 1883, Faun. Ent. Canada, Hym., p. 615, female.
Ammophila conditor Provancher, 1883, Faun. Ent. Canada, Hym., p. 616, male.
Ammophila barbata Cameron, 1888, Biol. Cent.-Am., Hym., vol. 2, p. 7.
Ammophila ceres Cameron, 1888, Biol. Cent.-Am., Hym., vol. 2, p. 8, male.
**Ammophila championi* Cameron, 1888, Biol. Cent.-Am., Hym., vol. 2, p. 9, female.
**Ammophila striolata* Cameron, 1888, Biol. Cent.-Am., Hym., vol. 2, p. 10, female.
Ammophila gryphus Howard, 1901, The Insect Book, Plate V, fig. 15, female.
Ammophila procera Melander, 1903, Psyche, vol. 10, p. 158.
Ammophila procera Hartman, 1905, Univ. Tex. Bull., no. 65, p. 11, Habits.
Sphex procerus H. S. Smith 1908, Univ. Neb. Studies, vol. 8, p. 328.
Sphex procera Rohwer, 1916, Hym. of Conn., p. 682.
Ammophila procera Rau, Ph. & N., 1918, Wasp Studies Afield, pp. 215, 226, 237, fig. 50. Habits.

Sphex procerus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 402.
Sphex (*Ammophila*) *procera* Rau, 1922, Trans. Acad. Sci. St. Louis, vol. 24, p. 24. Habits.
Sphex procerus Fernald, 1926, Ann. Ent. Soc. Am., vol. 19, p. 89.
Sphex (*Ammophila*) *procera* Rau, 1926, Trans. Acad. Sci. St. Louis, vol. 25, p. 211. Habits.
Sphex procerus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 448.

Usually a large insect, though varying greatly in size. Black except for ferruginous on more or less of the second petiole and one or more of the anterior abdominal segments, but even these may be almost entirely black, or, on the other hand they may be entirely ferruginous except for black spots. Pro- and Mesonotum transversely ridged. Pubescence white; on the clypeus, side of the frons, prothoracic lobe, a spot on the subalar plate (generally), a band on the mesopluron along the meso-metaplural suture from the mesocoxal knob to the base of the rectangle and sometimes onto it, at the metapluron along the propodeo-metaplural suture, at each side of the petiole, and in varying amounts on the middle and hind coxae above. As a rule there is little or no sericeous except sometimes on the cheeks, though the pubescence may grade into this. Pilosity on the head, generally black; elsewhere white. Thoracic pilosity often very abundant on specimens from arid regions and the Pacific Coast. Wings varying from slightly to deeply fuliginous.

FEMALE.—*Head:* Frons somewhat depressed medially. Clypeus swollen centrally, rather flat at the sides, coarsely but not closely punctured. Vertex rising above the posterior ocelli. Mandibles black, more or less piceous to ferruginous near the middle.

Thorax: Top and sides of Collar coarsely, transversely ridged, including the gutter, the front side of which is somewhat raised. Propluron smooth, sparsely punctured. Mesonotum transversely ridged, generally with a sericeous or pubescent spot just median to the tegula; in specimens from the southwest and the Pacific Coast the ridges often tend to become oblique or obsolete. Scutellum strongly, longitudinally ridged. Postscutellum confused; sometimes with ridges at the sides. Median band of the propodeal disk rather irregularly roughened and with many fine, erect hairs; the sides obliquely ridged, becoming more transverse behind; this portion shagreened; end and sides of the propodeum coarsely punctured and ridged, the ridges running down and but little forward; there is a pubescent spot

on each side of the petiole. Metapluron with a few punctures; ridged, the ridges running downward and slightly forward; the pubescent band along the propodeo-metaplural suture runs from the metacoxal knob forward a varying distance, generally to about under the propodeal spiracle, but may extend farther forward in western specimens. Mesopluron coarsely punctured, with a tendency for the punctures to form rows, and in front and below, ridges may also develop; there is a tendency of this plate to become sericeous, particularly below; epistèrnal suture slightly, evenly curved, extending down to about opposite the bottom of the prothoracic lobe.

Petiole: First segment black, though sometimes faintly ferruginous; second segment varying from almost black to entirely ferruginous.

Abdomen: Ranging from ferruginous on the first segment only, to entirely ferruginous except for dark or black spots here and there above; these last are examples of the form Smith named *saeva.*

Wings: Generally slightly fuliginous; sometimes strongly so; veins dark; second cubital cell of more than average width for the genus, behind. Tegulae black to piceous.

Legs: Black; spines black; coxal hairs black in eastern specimens; lighter in western ones; claws ferruginous.

MALE.—Differs as follows: Body generally more slender; less ferruginous on the abdomen. Clypeus rather flat, extending considerably below the eyes, its lower margin rounded at the sides, its center broadly, shallowly emarginate, the entire margin bent slightly forward. Metaplural pubescent band sometimes weak or even absent. Second petiole segment usually nearly or wholly black or piceous. First abdominal segment frequently black above and sometimes partly so on its sides.

LENGTH.—Females, 21-36 mm.; Males, 18-35 mm. Over 500 specimens studied.

DISTRIBUTION.—This species is widely distributed having been found in nearly every State; in "Can." (exact locality?); in Guadalajara, Meadow Valley, Ventanas and unnamed localities in Mexico, and in Guatemala.*

Dates of capture run from the last of April to the middle of November in some of the Southern States. Farther north they appear early in June and are reported as late as the middle of October. In the New England States they appear early in July and are taken until early in October. In those States where collectors are abundant (e. g., New Jersey) they have been captured from in June till into October, suggesting at least two generations a season and that members of a generation may live for some little time. Capture dates in Florida (Apr. 23, July 21, Oct. 21 and Nov. 13) at least hint at the possibility of three generations a season in the South.

*See Ann. Ent. Soc. Am., 1926, vol. 19, p. 88.

I have records of the capture of this species on the flowers of nine different species of plants.

TYPES.—The type of Dahlbom's *procerus,* he states, came from "Dom. Zimmermann." In the Dahlbom collection at Lund is a specimen of this species marked "Berl. mus. Erichson 1838"; "procera Klug", while at Berlin is one marked "N. America"; "4868"; "procera N", this last in Klug's writing and on the peculiar bluish-green paper used by him. As Klug published no species of Sphecini his names can rate only as museum labels, but Dahlbom apparently adopted them for publication. Dahlbom studied at Berlin and undoubtedly was familiar with Klug's work there. Whether the specimen in his own collection at Lund, the one at Berlin, or both together, should be considered the type may be uncertain, but in any case both are available for study.

Smith described *gryphus* from specimens of both sexes, from "Charleston; East Florida; California." In the British Museum is a female labelled "Type;" "gryphus Type Smith" in Smith's writing; another female marked with a small blank paper square, "E. Doubleday St. John's Bluff, E. Florida;" a male also marked with a small blank paper square, "39, 11-16, 342;" "E. Doubleday Charleston from Dr. Bachman;" and a male marked with a circular label bearing on one side the numbers "48: 135" and on the other "California." Where the specimen marked Type by Smith came from is not shown by its label but at least there are specimens from the three localities Smith named, in the collection. The California specimen agrees with Smith's comment on California specimens.

Smith's *saeva* was described from California and the type, so marked by him, is in the British Museum. It is certainly the form of *procerus* often met with on the Pacific Coast and in the more arid regions of Colorado, Utah, Nevada and the States south of these. Intergrades of color distribution with the typical *procerus* are well known.

Ammophila conditor was described by Smith from a male taken at St. John's Bluff, E. Florida. The type, so marked in Smith's

writing, is in the British Museum and is a small, dark example of *procerus*.

I was unable to find Smith's type of *barbata* in the British Museum collection, though several specimens there bear that name. Smith states it closely resembles *gryphus*, differing only in that the prothorax is shorter; the thoracic sculpture coarser and the pubescence more abundant. It was described from Mexico and two Mexican specimens are in the collection and may have been the ones used by Smith, but if so he failed to mark either as the type. Both are certainly *procerus*.

Cresson described *macra* from four male specimens from "Colorado Territory." One of these, later designated by him as the type (No. 1936-1) is in the American Entomological Society collection. I can make it nothing other than a small, dark specimen of *procerus*.

Cameron's type of *ceres*, from Guatemala, is in the British Museum marked Type. It greatly resembles Cresson's *macra* but is a little larger. *Championi* Cam., also from Guatemala, is represented by a specimen marked Type, in the same collection. It differs in no way from *procerus*, but there is little ferruginous present. *Striolata* Cam. is represented by the type female, so marked. It was taken at Ventanas, Mexico, and is the form having the abdomen largely ferruginous like Smith's *saeva*. It is certainly *procerus*.

This very variable species, both in size and color distribution, as might be expected from its wide range and the different climatic conditions under which it lives, is about the largest species of the genus present in North America. A rather full discussion of its variations with relation to climate was published in 1926 in Annals of the Entomological Society of America, volume 19, page 88, so that this topic need not be treated further here.

I have seen one specimen from Oregon in which the clypeal pilosity is white.

4. **Sphex politus** (Cresson). (Fig. 22.)

**Ammophila polita* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 458, female.

**Ammophila nearctica* Kohl, 1889, Verh. k. k. zool.-bot. Gesch., Wien, vol. 39, p. 18, male.

Ammophila polita Peckham, 1900, Bull. Wisc. Nat. Hist. Soc., vol. 1, p. 1-9. (not seen).

Ammophila polita Melander, 1903, Psyche, vol. 10, p. 160, female.

Ammophila nearctica Melander, 1903, Psyche, vol. 10, p. 162, male.

Sphex politus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 404, female.

Sphex politus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449, female.

Sphex nearctica Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449, male.

A small species, black except for the second petiole and first two or three abdominal segments which are largely or entirely ferruginous. Collar transversely ridged above (sometimes nearly smooth) and often on its sides. Mesonotum often transversely ridged. Scutellum longitudinally ridged. Sides of propodeum ridged, the ridges on its front part often running strongly forward. Wings semihyaline to somewhat fuliginous. Legs black. Body, and often the legs, quite completely but very finely silvery sericeous, frequently pubescent on the clypeus, sides of the frons, prothoracic lobe, on the mesopluron along the meso-metaplural suture, beside the petiole and on the hind coxae above. Pilosity scanty, black.

FEMALE.—*Head* nearly elliptical from in front, the median line on the frons only slightly depressed. Clypeus quite swollen centrally, its lower margin with two teeth wide apart, outside which the margin forms something of a flat rim; Ocelli nearly at the top of the vertex, entirely enclosed by indented lines. Cheeks rather narrow, front to rear behind the eyes and not projecting laterally as far as the eyes, and with long white hairs. Antennae black to piceous. Mandibles black to piceous with a dull ferruginous shade across the middle.

Thorax: Collar very variable in profile, from quite long and rising somewhat gradually, to quite short and rising almost without curvature, to its top; its front surface is smooth (always?) but its top and sometimes its sides are very finely ridged; the gutter (depression in front of the prothoracic lobe) is incomplete, there being no raised front margin. Mesonotum generally transversely ridged, but the ridges are sometimes almost obsolete. Scutellum longitudinally ridged, the ridges often diverging backward, somewhat. Postscutellum punctured, possibly with a few ridges.

Propodeal disk with a confused median band; ridged at its sides, the ridges running outward and backward in front, nearly transversely behind; propodeal sides finely ridged, with a tendency (sometimes actually) of those on the front half to run strongly forward; those running downward continue downward across the metapluron. Mesopluron rather coarsely, not closely punctured behind, the punctures in front tending to arrange in rows and with traces of ridges. Episternal suture short.

Petiole: First segment longer than the second, black to dull ferruginous; second segment ferruginous, rarely with a dark streak above.

Abdomen: First two segments ferruginous; the undersides of more or less of those following may be partly ferruginous.

Wings: Hyaline or semihyaline to somewhat fuliginous; veins dark brown. Tegulae piceous.

Legs: Coxae to tibiae inclusive very dark brown. Tarsi piceous. Coxae, middle and hind trochanters and femora whitish sericeous. Leg spines dark brown or piceous.

MALE.—Differs as follows. Clypeus quite long, not noticeably swollen centrally; its lower margin with a slight, broad, median emargination lateral to which the margin runs somewhat outward and strongly upward to beneath the eye in a nearly even curve. The sericeous hairs on the clypeus and frons are more dense, almost becoming a pubescence and the entire insect is more sericeous than the female, generally concealing most of the markings on the plates beneath. Mesonotal ridges liable to be lacking at the sides. Mesoplural pubescent band stronger, grading into sericeous in front. First segment of the petiole piceous; second piceous above. First two abdominal segments ferruginous, the others black but with more or less of ferruginous shades on some of them beneath. Legs sericeous, particularly the coxae; claws light. Spines the color of the segment they are on, or lighter. The wing veins tend to be slightly yellowish.

LENGTH.—Females, 12½-15 mm.; Males 11-15 mm. Twelve females and nineteen males studied carefully; a number of others more casually.

DISTRIBUTION.—I have seen specimens of this species from northwestern Nebraska, Colorado, Nevada, Montana, Washington, Oregon and from northern California and higher altitudes near the center of the State. Two specimens marked "N. Mex." are, in my opinion, of doubtful authenticity. Dates of capture are: Nebraska, July; Montana, July 6, 25; Oregon, June 27, July 4, 24; California, Sonora Co., July. From these dates it would seem probable that there is but one generation of *politus* each season. I have seen no record of the capture of this species on any plant.

TYPES.—This species was described by Cresson from two female specimens taken in "Colorado Territory," one of which he subsequently designated as the type (No. 1937-). It is in the

collection of the American Entomological Society. Kohl described the male under the name *nearctica* and in the Wien Museum are two specimens, one marked "Wash. Terr. Ettersburg" and "nearctica Kohl Type det. F. Kohl"; the other marked "Wash. T. Thorp." and "nearctica K. Type. det. F. Kohl."

VARIATIONS.—The male frequently has ferruginous spots on the legs which are sometimes entirely tinged with dark ferruginous. When the mesonotal ridges do not cover the whole plate they are usually present near the median line. The outline of the clypeal margin in the male varies somewhat, also, the median emargination being stronger in some cases than in others and the lateral portion turns upward more sharply.

This species frequently has abnormal venation, generally in the form of a defective third cubital cell. This is true of the male types at Wien.

Occupying a portion of the same territory as *politus,* but extending farther south, is a species so similar that in some cases it is almost impossible to separate the two. Yet the extremes are so different that after placing the insects together for more than five years I have finally decided to recognize two species, calling the other, *Sphex parapolitus.* Anyone who traces an insect by the key to *politus* or *parapolitus* should also compare it with the descriptions of both. Following the description of *parapolitus* a comparison of the two species and a statement of their distinctive characters as far as it is possible to give them, will be found.

5. **Sphex parapolitus** n. sp. (Figs. 17, 23).

Insects of rather small to medium size for this genus. Collar above and often on the front transversely ridged, generally rising quite sharply from the neck and, turning sharply backward above though not angulated there. Mesonotum coarsely, transversely ridged. Body black; abdomen ferruginous, with more or less of black or dark. Legs partly ferruginous in the female; black, generally with traces of ferruginous in the males. Petiole generally, but not always ferruginous. Wings almost hyaline. Mandibles usually ferruginous out to the bases of the teeth. Scutellum longi-

tudinally ridged. White pubescence on the clypeus and sides of the frons, the prothoracic lobe, near the meso- and metaplural coxal knobs and beside the petiole, generally shading off into sericeous. Pilosity white, the hairs quite long, fairly abundant on the head and sides of the body.

FEMALE.—*Head* broadly oval in front. Clypeus somewhat swollen transversely near the center; sparsely, coarsely punctured; it and the sides of the frons rather heavily sericeous to pubescent; marginal teeth wide apart; lateral to the teeth the edge is slightly emarginate, then curves gently upward to below the eye. Frons only slightly depressed along the median indented line. Ocelli entirely enclosed by indented lines. Cheeks only very slightly sericeous behind the eyes. Antennae black, scape, pedicel and often the first filament segment piceous or tinged with ferruginous.

Thorax: Collar generally rising rather sharply from the neck and continuing straight upward for a time, then curving quickly (not forming a sharp angle) backward, somewhat rounded on top in profile, then turning slightly downward to join the mesonotum; its front generally, its top and sides coarsely, transversely ridged, though the ridges are often weak in the gutter, the front margin of which is very poorly developed. Prosternum smooth, with a few scattered punctures. Mesonotum coarsely, transversely ridged, the ridges not continuous across the median groove. Scutellum coarsely, longitudinally ridged, the lateral ridges tending to become oblique. Postscutellum confused but with at least traces of a few ridges. Propodeal disk quite broad behind the spiracles, its median band with abundant, short, white hairs; its lateral parts shining and shagreened; end and sides ridged, the side ridges running downward and only very slightly forward; some of them seemingly continuous with those on the disk; sides and metapluron rather closely, but not densely sericeous, rather concealing any marking on the latter plate and tending to become pubescent along the suture between the two for a short distance forward from the metacoxal knob. There is a thin pubescent spot on each side of the petiole. Mesopluron similarly sericeous, tending toward pubescence from the mesocoxal knob forward along the suture to the base of the rectangle; the plate appears to be only sparsely punctured; its episternal suture short. Pectus, except on the prothorax, sericeous.

Petiole: As long or longer than the hind coxa, trochanter and femur together, both segments usually ferruginous though the first is sometimes darker.

Abdomen: Ferruginous, but with dark or black shades or spots, particularly above and most often on the third and fourth segments.

Wings: Hyaline or nearly so; the veins ferruginous to brown; second cubital cell wide behind. Tegulae pale resinous.

Legs: Coxae and sometimes the trochanters usually black; remainder of legs ferruginous, the spines on the tarsi darker; fore femoral and tibial hairs long, white or light; comb teeth long, slender.

MALE.—Differs from the female as follows. Smaller; clypeus not extending far below the general outline of the head, its margin broadly, very slightly emarginate on its central half, lateral to which it turns upward rather quickly toward the eye. First petiole segment black; second ferruginous, generally with a black dorsal streak. Legs black or piceous, sometimes varied with ferruginous. Body more strongly sericeous and pubescent.

LENGTH.—Females, 16-23 mm.; Males 16-18 mm. Thirty-one females and five males studied.

DISTRIBUTION.—Washington (Wawawai), Oregon, Utah and California (northern, central and southern.)

TYPES.—Described from a holotype female from "Felton, St. Cruz Mts., May 20-25, '07, Cal., 300-500 ft. Bradley," and an allotype male from "Mth. Los Gatos Cn. Mt. Diablo Rg. Fresno Co., Cal., Jn. 2, '07 Bradley" in the Cornell University collection, and from six female and three male paratypes. These are now located: one female and one male in the U. S. National Museum collection; one female and one male in the collection of Dr. W. W. Mann of Washington, D. C., their captor; one female in the American Entomological Society collection, one female in the collection of Dr. Jos. Bequaert of the Harvard School of Tropical Medicine at Boston; one female in the collection of Prof. Charles H. Hicks of Boulder, Col., and a male and female in my own collection.

VARIATIONS.—These are almost wholly of the area covered by ferruginous on the petiole, abdomen and legs; of the amount and density of the sericeous hairs and the strength of the pubescent areas. Two females studied have only two cubital cells.

This species is most perplexing as it shows almost no structural differences from *politus* and I long regarded the two as extreme variations of a single species. The chief differences in the females besides size are that the legs are almost always partly ferruginous, the ridges on the collar and mesonotum are coarser and the abdomen is usually all ferruginous except for a few black or dark spots above, in *parapolitus*. In the male the only

differences I can find are the larger size and the coarser ridges on the collar and mesonotum. The pilosity differs in color in the two species. The two species appear to overlap in their distribution.

Species 6-7: Propodeal sides with nearly horizontal ridges;
6-8: Female with toothed hind claws.

6. **Sphex volcanicus** (Cameron). (Fig. 36.)

**Ammophila volcanica* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 17, female.

**Ammophila femur-rubra* Fox, 1894, Proc. Cal. Acad. Sci., (2), vol. 4, p. 102, female.

A medium sized species of the genus. Head, thorax, part or all of the abdomen and legs, black. Pubescence and sericeous hairs white. Pilosity scanty; white on the body, black or mixed on the head. Ridges on the propodeal sides running downward, then strongly forward. Collar rising nearly straight to a rather narrow top in the female; more broadly rounded to a somewhat broader top in the male.

FEMALE.—*Head* broad, retreating slightly behind the eyes, seen from above, slightly hour-glass shaped. Clypeus rather narrow vertically, only slightly swollen; with scattered, rather coarse punctures; its surface silvery to yellowish sericeous; its marginal teeth far apart, lateral to which the margin curves upward somewhat, then outward to below the eye; margin between the teeth sometimes ferruginous; surface with long, erect, white, and a few black hairs. Frons strongly depressed medially, its surface sericeous laterally; median indented line continued to the ocelli and by them, with a cross line behind. Vertex slightly higher medially than the ocelli. Cheeks sericeous behind the eyes and bearing long, white hairs. Mandibles black, sometimes with a ferruginous tinge.

Thorax: Collar rising nearly at right angles from the neck to a rather narrow top with its front rounded; with a median groove on top, often concealed by sericeous hairs; lateral indented line from the front of the base to the gutter well developed; prothoracic lobe often quite densely pubescent, sometimes tending to golden in color; collar without transverse ridges. Mesonotum also not ridged, quite sericeous. Scutellum finely, longitudinally ridged, often hard to see. Propodeal disk dull black, shagreened, with rather coarse ridges, mostly continuous across the middle; no median sericeous band; end with a large pubescent spot on each side

of the petiole; sides with ridges which behind run down and slightly forward; farther in front they are more regular, longer, and run down, then strongly forward; there is a sericeous to pubescent spot beside the disk in front of the spiracle. Metapluron pubescent from the metacoxal knob forward along the propodeo-metaplural suture for some distance, perhaps to the lower end of the triangle in some cases and often grading on its lower side into sericeous; remainder of this plate apparently smooth or sparsely, finely punctured, Mesopluron with a similar pubescent band from the mesocoxal knob forward along the suture to the base of the rectangle, and on its lower side grading into sericeous which often covers most of the rest of the plate which bears small, scattered punctures; rectangle with scattered, very fine punctures; episternal suture extending well down toward the coxa; with a slight forward emargination about opposite the lower part of the prothoracic lobe.

Petiole: Ferruginous, though the first segment may sometimes be almost black and the second may be shaded with darker.

Abdomen: First and second segments, and often parts of the third and fourth, ferruginous, the black on the dorsal side when present; any of the segments may be shaded with darker here and there, even when the petiole is entirely ferruginous.

Wings: Nearly hyaline, the smaller veins dark yellow, the larger ones more brownish; second cubital cell rather narrow behind. Tegulae pale ferruginous.

Legs: Everywhere whitish sericeous in fresh specimens, increasing on parts of the coxae almost to pubescence. Coxae and trochanters black but often tinged in places with ferruginous. Femora, tibiae and tarsi usually ferruginous but often (tarsi particularly) darkened to piceous or streaked with piceous. Spines, hairs and claws all light; the hind claws with a very tiny tooth near the base.

MALE—Clypeus rather long, slightly swollen but also slightly depressed along its middle lower third, giving a somewhat bilobed appearance there; its lower margin slightly reflexed, the central third nearly transverse or sometimes slightly emarginate; the lateral third gently rounded outward and upward to below the eye; entire surface and the frons up to the antennal fossa and above this on the sides, densely sericeous to pubescent; hairs on the clypeus, frons, vertex and cheeks quite long, light to white. Collar more rounded in profile than in the female, its lateral indented line not strong; its surface sericeous and with numerous erect, rather slender, white hairs; median groove of the collar weak. Mesonotum with traces of very fine transverse striae (hidden by the sericeous hairs in the female?). Scutellum very finely, longitudinally ridged. Ridges on the sides of the propodeum finer than in the female. First segment of the petiole and a dorsal line on the second, black. Last four segments of

the abdomen black. Wings varying from almost hyaline to rather fuliginous; veins brown. Tegulae blackish, mottled with dull ferruginous. Legs black or piceous, either more or less entirely or in spots which may even be nearly a dark ferruginous. Spines light; claws light. This sex has not heretofore been described.

VARIATIONS—In two specimens which I cannot otherwise distinguish from this species the episternal suture ends about opposite the lower side of the prothoracic lobe, which raises the question of the value of this character for the separation of species. In a few specimens weak, oblique ridges running downward and forward are present on the metaplural triangle and on the mesapluron between the prothoracic lobe and the episternal suture.

LENGTH—Females, 13—20 mm.; males, 13—17 mm. Fifty-four females and twenty-two males studied, most of them from Hereford, Arizona.

DISTRIBUTION—I have seen specimens of what I consider this species from Hereford, Cochise Co., Arizona; New Mexico; California (not more closely located); Lower California (San Jose del Cabo); Guadalajara and Tuxpan, Jalisco, Mexico, and one marked "Col." of which I question the accuracy, though the species may occur in the southern part of that State. Dates of capture are August 25 and 29 in Arizona; July 27, Aug. 27 and Oct. 2 in New Mexico, and July 6, 21 and Sept. 3 in the Province of Jalisco, Mexico. It has been taken on the flowers of the garden chrysanthemum, *Biglovia* sp., *Kallstrozmia* and *Solidago arizonica.*

TYPES.—Cameron described this species from a female taken at "Volcan de Chiriqui, Panama, 2000 to 3000 feet." This specimen, marked Type, and another from the Biologia collection, taken at Bugaba, Panama, are in the British Museum. *Ammophila femur-rubra* was described by Fox from seven female specimens taken at San Jose del Cabo, Lower California, in October. The one marked Type is in the American Entomological Society collection. The male is here described from an allotype from "L. Cal." and a parallotype from "Tuxpan Jal. IX 3 Mex. McClendon" in the American Entomological Society collection.

I regret that I cannot be absolutely sure of the identity of the species described here with Cameron's *volcanica* though I believe them to be the same. Specimens should be critically compared with Cameron's type to settle this. If it is not *volcanicus* Fox's name will hold.

This species appears to be quite rare though rather widely distributed, the only person who appears to have captured more than one or two specimens being Dr. W. M. Mann who took over fifty at Hereford, Cochise Co., Arizona.

7a. Sphex ~~guerinii~~ placidus guerinii (Dalla Torre). (Fig. 9.)

Ammophila apicalis Guerin, 1845, Icon. regn. anim., vol. 7, Insect., p. 435; Pl. 70, fig. 3 (nom. preocc.).
Ammophila apicalis Lucas, 1856, Sagra, Hist. fis. Cuba, vol. 7, p. 763.
Ammophila guerinii Dalla Torre, 1897, Catal. Hymen., vol. 8, p. 400.

Rather below medium size for this genus. Head and body dull black, caused by a dense covering of black, sericeous hairs, lightened by scattered but abundant white ones. Second petiole segment and part of the abdomen dull ferruginous. Wings rather fuliginous, the veins dark ferruginous. Legs black. Ridges on the propodeal sides running strongly forward in the female; less evidently so in the male. Pilosity black on the head; short, sparse, on the body, and whitish in the females; longer, denser and black in the males. Second cubital cell narrow, generally narrower than high.

FEMALE—*Head:* Broad, rather hour-glass shaped from above, the cheeks quite full and extending both well outward and backward. Clypeus slightly swollen centrally, rather sparsely punctured. Ocelli almost at the top of the head, enclosed by indented lines. Clypeus, frons, vertex and cheeks quite white sericeous but hardly pubescent.

Thorax: Collar rising at quite an angle from the neck for some distance, then turning backward and rounding evenly before bending downward in front of the mesonotum, its upper part not very wide in profile; dull black, relieved by abundant white, sericeous hairs; its sides the same; its surface not transversely ridged; prothoracic lobe pubescent; pilosity on the prosternum and fore legs black. Mesonotum black but well covered by white, sericeous hairs, making the surface look frosted in fresh specimens and concealing any markings on the plate. Scutellum and postscutellum similarly covered, but with less of the white sericeous; the former weakly longitudinally ridged, these often concealed by the sericeous. Propodeal disk not sericeous; dull, dead black with rather close ridges, oblique in front, more transverse behind, the lateral portions shagreened; end with a well developed pubescent spot on each side of the petiole; the rest covered by black sericeous liberally mixed with white; sides similarly

sericeous but with ridges showing; these behind run downward and a little forward, but on most of the side run first downward, then strongly forward nearly paralliel to the propodeo-metaplural suture—a very characteristic marking. Metapluron well covered by black sericeous strongly mingled with white which is particularly dense along the suture, sometimes almost pubescent there. Mesopluron similarly covered, the white sericeous sometimes very continuous, making the entire plate look silvery white. Episternal suture extending well down to the underside of the body.

Petiole: First segment black, shining; second reddish ferruginous, occasionally with more or less of a black streak above.

Abdomen: First, second and more or less of the sides of the third segment reddish ferruginous; the extent of this on the abdomen undoubtedly varying somewhat; remainder black. Rather stout for the length of the insect.

Wings: Somewhat fuliginous, the veins light to reddish ferruginous; second cubital cell narrow, usually only a little wider behind than high. Tegulae light to dark brown.

Legs: Black, sometimes slightly piceous outwardly; coxae quite white sericeous; hairs on the fore legs black; all the leg segments more or less whitish sericeous; spines dark to black; claws dark, lighter outwardly, with a minute tooth at the base of each claw.

MALE—More slender; body pilosity black, the hairs quite long. Clypeus broadly, slightly emarginate on its lower margin, then bending upward rather quickly, evenly and then outwardly to below the eye. Ridges on the sides of the propodeum almost concealed under the sericeous hairs but apparently not running as strongly forward. Scutellum strongly, longitudinally ridged. The black on the abdomen is liable to extend farther forward and more or less completely cover the second segment. Claws without teeth. The white sericeous is less well developed and real pubescence is limited to the prothoracic lobe and beside the petiole.

LENGTH—Females, 16—18 mm.; males, 17—19 mm. Ten females and three males studied. The length range is probably greater than that given.

DISTRIBUTION.—I have seen this species only from Cuba.

TYPE.—I have not seen Guerin-Meneville's type. His Hymenoptera collection is reported by Dr. Walther Horn as being in part at Turin; in part at Munich and in part in Paris. If the type is in existence it is probably at Turin or Munich as I failed to find it in Paris.

Guerin's description of *apicalis* is so indefinite that it would fit many species and Sagra's is little better. But as the insect de-

scribed here is the only small species of the genus I have seen from Cuba, and as it appears to be not uncommon there, it seems most probable that it is Guerin's *apicalis*. This name, having been previously used by Brulle in 1840 for another species of the genus, is not available and it was therefore changed by Dalla Torre to *guerinii*.

Much to my surprise when I began to study it, I found almost no differences between this insect and Smith's *placidus* from California. The silvery white sericeous hairs, so abundant on *guerinii* are almost entirely absent in *placidus* and the pubescence on the prothoracic lobe and beside the petiole of *guerinii* are usually entirely lacking in *placidus* though in some cases there are faint traces of it. The wing veins in *placidus* are nearly honey yellow, while those in *guerinii* have more of a reddish tinge, particularly toward the base of the wing. With only these differences in evidence I find myself unable to separate the two and as *guerinii* was described in 1845, while placidus was described in 1856, *guerinii* must become the name of the species.

7b. Sphex ~~guerinii~~ placidus placidus (F. Smith) (Fig. 7).

**Ammophila placidus* F. Smith, 1856, Cat. Hym. Ins. Brit. Mus., Part 4, p. 221, male.

Ammophila pictipennis Walsh, 1869, Am. Ent., vol. 1, pp. 128 & 164, fig. 100, female, male.

**Ammophila anomala* Taschenberg, 1869, Zeits. f. d. ges. Naturw., vol. 34, p. 434, female, male.

Ammophila pictipennis Riley, 1873, 5th Ann. Rept. Ins. Mo., p. 149, fig. 73.

Ammophila pictipennis Howard, 1901, Insect Book, Plate 7, fig. 7.

Ammophila pictipennis Banks, 1902, Journ. N. Y. Ent. Soc., vol. 10, p. 210. Sleeping habits.

Ammophila extremitata var. *pictipennis* Melander, 1903, Psyche, vol. 10, pp. 161, 163.

Sphex extremitatus H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 30. (In part.)

Sphex (*Sphex*) *nigropilosus* Rohwer, 1912, Proc. U. S. Nat. Mus., vol. 41, p. 465, female.

Sphex extremitatus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 404. (In part.)

Sphex extrematata var. *pictipennis* Rohwer, 1916, Hym. of Conn., p. 682.
Sphex (Ammophila) pictipennis Rau, Phil & Nellie, 1918,. Wasp Studies Afield, p. 207. Habits.
Sphex (Ammophila) pictipennis Rau, 1922, Trans. Acad. Sci. St. Louis, vol. 24, p. 23. Habits.
Sphex placidus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449.

Black except for the second petiole and the first and part of the second abdominal segments which are ferruginous. Head and body in fresh specimens so densely covered with dull black sericeous hairs as to practically conceal the markings on the plates beneath. Pubescence lacking except on the prothoracic lobe and beside the petiole in a few cases. Pilosity black. Sides of the propodeum with ridges running down, then forward nearly horizontally as in the other two varieties, when visible. Wings yellow, slightly fuliginous, especially beyond the veins which are honey yellow. Claws in the female with a tiny tooth at the base, very hard to see without removal and mounting of the claw. Second cubital cell generally narrow behind. A rather shorter insect than the average, but stouter than usual.

FEMALE.—*Head:* Rather large, slightly hour-glass shaped from above, the cheeks being quite full both laterally and behind. Clypeus somewhat swollen centrally, its surface with scattered, rather coarse punctures; the teeth on its lower margin quite widely separated. Frons strongly depressed between the eyes. Ocelli slightly below the top of the head. Mandibles black, rarely somewhat piceous.

Thorax: Dull black except where the sericeous covering has been worn off, and on the propodeal disk and this is not glossy but dull though not so covered. Collar rather broad in profile at its base, rising upward quite obliquely, nearly straight or but slightly curved backward, to a rather narrow top which shows a median indentation on its hinder edge just before the plate turns downward to join the mesonotum; prothoracic lobe bearing black hairs, rarely slightly white pubescent. Mesonotum occasionally showing traces of transverse ridges. Scutellum with fine longitudinal ridges under the sericeous covering. Propodeal disk finely ridged, even the front ones only slightly oblique, the ridges distinct along the median line, there being no median band. Episternal suture extending well down toward the fore coxae.

Abdomen: Rather stout; its first segment, usually all of the second, and sometimes more or less of the third, ferruginous; yet the second may be dark or black in places.

Wings: Hyaline or nearly so to beyond the cells, the outer part somewhat fuliginous; membrane between the veins yellowish and the veins strongly so; second cubital cell narrow for the genus, often little wider behind than in front. Tegulae black in front, piceous or somewhat pale behind.

Legs: Black, the tarsi sometimes piceous; hairs and spines black; claws with a tiny tooth at the base, often very hard to see.

MALE—Rather more slender; liable to show more traces of pubescence, particularly in southern specimens. The forward running ridges on the sides of the propodeum run less strongly forward. Claws not toothed. The fuliginous of the wings is liable to extend somewhat farther in toward their base.

VARIATIONS—Southern and western examples of this species average larger and are more coarsely marked than those from the Eastern United States, but intergrades between the extremes are frequent. A loss, apparently of the second transverse cubital vein, or some similar modification, results in the presence of only two cubital cells in some cases. Two of the three males described by Taschenberg are in this condition and I have met with five males and three females similarly modified. In one female from Southern California the second transverse cubital vein was represented by a short stub extending backward from the radial cell. One female, captured in New Mexico, had been stylopized.

LENGTH—Females, 13—24 mm.; Males, 13—21 mm. Over 400 specimens studied.

DISTRIBUTION—I have seen specimens from all the Atlantic Coast and Gulf States except Maine; from all the States bordering on Canada from New York to Montana, inclusive; from New Mexico, Arizona and California (southern, central and northern); from Montreal and other Canadian (unnamed) points, and from all the States between those forming our northern and southern boundaries from which collections have been seen, as far west as Colorado. I have seen none from Utah, Nevada, Oregon and Washington in collections received from those States, nor from Idaho and Wyoming where apparently little collecting has been done. Dates of capture indicate the appearance of this species in March and April in the more southern States and their capture almost every month thereafter until the middle or end of October. Farther north the dates of first appearance are later: May in New Jersey, Ohio, Nebraska, etc.; June in Michigan and Minnesota, with captures as late as October in those States. In New England the earliest seen was July 21, and the latest, September 12. In many States it is evident that little or no systematic collecting of digger wasps has been done, but from the above it seems likely that this species has three generations a season in the South and two in the North.

There is quite a long list of plants visited by this species, most of them belonging to the Compositae.

TYPES.—Smith described *placida* from a single male from California. This specimen is in the British Museum marked "placida Type Sm" in Smith's writing. Taschenberg described *anomala* from a female and three males from Illinois. Prof. O. Taschenberg kindly loaned me the female and a male of this lot for examination. The male is labelled "Illinois;" "3 cell cubit deficit;" "anomala-* Zeitsch, 1869, 434 Illin Brndt" and is one of the two males described as lacking the third cubital cell. The female is labelled "Illinois;" "†" with two or three letters above the sign which I am unable to read; "12." These insects are the same species as *placida,* but of the more eastern form. Walsh's type of *pictipennis,* which is certainly this species, was probably destroyed with the rest of his collection by fire. There is a male in the National Museum collection bearing the labels "Type"; "446"; "Through C. V. Riley." The label "Type" Mr. E. A. Schwarz informs me is in the handwriting of Mr. G. W. Belfrage of Texas. It can hardly be one of Walsh's types, therefore.

I have not seen Rohwer's type of *nigropilosus,* described from the "Federal District of Mexico," and now in the National Museum collection, but with other specimens from the same locality loaned me by the Museum I fail to find the second tooth on the claw as described by him. This has also been the case with others who have examined the type itself. The other characters given by Rohwer are well within the variation limits of this species as here described.

7c. Sphex placidus extremitatus (Cresson).

**Ammophila extremitata* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 457, female.

Ammophila extremitata Melander, 1903, Psyche, vol. 10, pp. 157 & 161.

Sphex extremitatus H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 330. (In part.)

Sphex extramatata Rohwer, 1916, Hym. of Conn., p. 682.

Sphex extremitatus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 404.

Sphex placidus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449.

This form of *guerinii* so closely resembles *placidus* that no extended description is needed. It differs from *placidus* by having quite uniformly fuliginous wings; the pubescence is more strongly developed on the prothoracic lobe, beside the petiole, and to some extent on the mesopluron along the meso-metaplural suture just above the mesocoxal hump, though this may not always be present, and rarely there is a similar band on the hinder part of the metapluron along the propodeo-metaplural suture; there is generally a greater amount of ferruginous on the abdomen, covering about three segments and the legs are often somewhat brownish, particularly outwardly. In size and in other regards there is no noticeable difference from *placidus,* and I have not as yet seen a male which differs enough from *placidus* to be considered this variety.

DISTRIBUTION.—This form appears to be most frequently met with in Nebraska, Colorado, Kansas and that general region though two specimens from North Carolina and one from Mexico approach it.

TYPE.—Cresson described this insect from eight females taken in "Colorado Territory," one of which he later selected as the type. This one, so marked (No. 1925-1), is in the collection of the American Entomological Society.

8. **Sphex xanthopterus** (Cameron).

**Ammophila xanthoptera* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 8, Plate I, fig. 4, female.

Ammophila xanthoptera Cameron, 1900, Biol. Centr.-Am., vol. 2, Errata et Corr. (emended).

Ammophila xanthoptera Melander, 1903, Psyche, vol. 10, pp. 160, 163, female.

Sphex xanthopterus Hicks, 1932, Can. Ent., vol. 64, p. 193. Habits.

A rather large, stout species with dark yellow wings somewhat fuliginous beyond the veins. Head, thorax, first petiole segment, part of the abdomen and the legs, velvety black, sometimes with a bluish reflection. Pilosity mostly black on the head, white elsewhere. Sericeous hairs black or bluish black. The

white pubescence is limited to the prothoracic lobe and a spot on each side of the base of the petiole, all small. Male unknown.

FEMALE—*Head:* Quite densely black sericeous, rather quadrangular from above, the cheeks being full, both backwardly and laterally; quite thickly pilose. Clypeus somewhat swollen centrally, its marginal teeth about one-third of the length of the margin apart, the portion between the teeth slightly reflexed; surface with scattered, coarse punctures and finely shagreened. Frons not much depressed medially except at the antennal fossa. Vertex rather flatly rounded, the ocelli below it. Frons, vertex and cheeks black sericeous and bearing numerous long, black hairs.

Thorax: Collar not broad below in profile, rising somewhat obliquely and rounded above to form a rather narrow top which bends downward quickly to articulate with the mesonotum; its top rather flat across the body and with a slight median depression behind; its sides not quite vertical, slightly rounded; lateral indented line evident but not strong, reaching to, and crossing the upper part of the gutter which has a well developed front margin and itself is smooth; the hairs on the collar white, much finer and shorter than on the head; prothoracic lobe black, quite smooth with a trace of white pubescence on its hinder edge. Mesonotum densely black sericeous, with scattered, short, fine, white, erect hairs. Scutellum sericeous like the mesonotum, its front portion rather high; with traces of longitudinal ridges behind. Postscutellum similarly sericeous. Propodeal disk transversely ridged in front of the spiracle, more obliquely so behind; somewhat sericeous and bearing scattered, tiny, white, erect hairs; end with a whitish pubescent spot between the petiole and the metacoxal knob; its surface with ridges crossing above the petiole and becoming vertical toward the metapluron; sides with somewhat discontinuous ridges running down and slightly forward; near the front they become more vertical again. Metapluron somewhat ridged near the propodeometaplural suture, some of the ridges crossing it, but they are soon lost below except for traces near the mesocoxa; its surface generally punctured and bearing quite long, but fine, white hairs; triangle finely ridged, the ridges running downward and forward. Mesopluron less densely sericeous than the other thoracic plates, bearing fairly abundant, rather fine punctures and shagreened; pilosity consisting of quite long, slender, white hairs; in some specimens there is a trace of a white, sericeous stripe beside the meso-metaplural suture near the mesocoxa; episternal suture extending down from the subalar area in an almost straight line to nearly opposite the bottom of the prothoracic lobe where it makes a slight forward arch before continuing down to the underside of the body.

Petiole: First and base of the second petiole segments black; remainder of the second segment dark ferruginous.

Abdomen: First two segments and sometimes part of the third, dark ferruginous, sometimes suffused with black; remainder black, occasionally with a bluish reflection; surface very minutely sericeous or pruinose.

Wings: Rather dark yellow to beyond the cells where they become faintly to quite fuliginous; veins darker than honey yellow; second cubital cell not of greater than average width behind; third cubital cell making about a right angle at its outer, back corner. Tegulae black, shining.

Legs: Black, more or less shagreened; spines and hairs black except for a few small, white hairs in some specimens; middle and hind trochanters sometimes white sericeous which may continue outward and the tarsi be quite sericeous. Claws black; with a tiny tooth.

VARIATIONS.—Two specimens from "Mt. Lemon, Ariz., Sta. Catalina Mts. 6000 ft.," captured July 27, 1917, by Dr. Joseph Bequaert, have the wings less strongly yellow, more fuliginous; the pronotal hairs are black, and there is a very faint trace of white sericeous on the metapluron along the propodeo-metaplural suture for a short distance.

MALE.—Unknown.

LENGTH.—Females, 20-29 mm. Twenty-nine specimens studied.

DISTRIBUTION.—Colorado (probably southern); New Mexico; Arizona; Southern California; Uruapan and other (unnamed) places in Mexico; Calderas, Guatemala. Dates of capture are: Arizona, July 15, 24, 29, Aug.; New Mexico, Aug. 8; Los Angeles, Cal., Aug. 7, 19, Sept. 3-12; Uruapan, Mex., July 12.

TYPE.—Described from a single female specimen taken at Calderas, Guatemala. This specimen, labelled Type by Cameron, I have studied in the British Museum. Hicks' interesting description of the nesting habits of this species is the first addition to our knowledge of it since it was described. The capture of a pair, so that the male can be recognized, is greatly to be desired.

Species 9-12. Episternal suture a widely open V.

9. **Sphex aureonotatus** (Cameron). (Figs. 26, 40).

?*Ammophila gracilis* Lepeletier, 1845, Hist. Nat. Ins., Hym., vol. 3, p. 381, female.

**Ammophila aureonotata* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 7, female, male.

?*Ammophila gracilis* Howard, 1901, Insect Book, Plate VII, fig. 9.

Ammophila abbreviata Melander, Psyche, vol. 10, pp. 157, 159, 161.

Ammophila aureonotata Melander, Psyche, vol. 10, p. 159.

Sphex abbreviatus H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 329.
Sphex abbreviatus Rohwer, 1916, Hym. of Conn., p. 682.
Sphex abbreviatus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 401.
Sphex abbreviatus Rau, 1922, Trans. Acad. Sci. St. Louis, vol. 24, p. 24. Habits.
Sphex aureonotatus Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 446.

Nearly all (probably all) references to *abbreviata* for captures in the United States are referable to *aureonotatus* which is quite generally distributed, while I have thus far failed to find a single specimen of the true Fabrician *abbreviatus* from North America and doubt if it occurs north of Central America even if that far north. The type of *abbreviatus* is from Brazil.

Entirely black, sometimes slightly piceous on the second petiole and first abdominal segments; about of average size for the genus. Pubescence golden, or silvery with more or less of a golden tinge; much of the body in fresh specimens with a fine black or brownish sericeous covering, generally not dense enough to conceal the markings on the plates beneath. Pilosity rather scanty, longest on the head where some of the hairs may be black, as also on the prothorax; elsewhere they are white and very short. Mesonotum somewhat transversely ridged in front. Pubescence present on the clypeus, sides of the frons (these may be only sericeous), prothoracic lobe; as a rather triangular area bounded above by the meso-metaplural suture and in front by the episternal suture; against the side of the propodeal disk in front of the spiracle (always?); a large spot on each side of the petiole attachment; and sericeous to pubescent areas along the middle of the mesonotum and on the upper side of the meso- and metacoxae. Hinder, outer corner of the third cubital cell distinctly rounded. Wings slightly to somewhat fuliginous. Legs black.

FEMALE.—*Head:* Broadly oval in front, hardly oblong from above, the cheeks not projecting enough laterally. Frons, though strongly depressed at the antennal fossa, only slightly so above. Clypeus slightly, broadly swollen near its middle; its lower margin not much below the eyes, the teeth far apart; between the teeth the margin is nearly straight or only faintly emarginate; lateral to them it rounds downward very slightly and outward to below the eye; the surface, whitish to golden sericeous or pubescent in some cases, is coarsely, rather sparsely punctured and bears

long, black hairs. Frons sericeo-pubescent on its sides well up toward opposite the ocelli; rather more sparsely and finely punctured than the clypeus and with short, white or yellowish hairs. Vertex showing considerably above the ocelli, its surface often minutely sericeous and bearing a few, short hairs. Cheeks smooth, shining, with little if any sericeous but with long, light colored hairs.

Thorax: Collar rising rather sharply from the neck nearly straight for some distance, then rounding to a narrow top; a depression, starting at the median line about half way up and forking, forms two diverging grooves which divide the front side into a median and two lateral lobes but these do not reach the back side, the lobes not showing strongly at the back of the top; lateral indented line not strong, but present to the gutter which it reaches below the top; gutter with a rounded raised front margin; gutter surface with a few coarse ridges; surface of the collar quite smooth, with scattered, rather fine punctures and more or less sericeous; prothoracic lobe densely pubescent except in front. Mesonotum more or less ridged transversely, with punctures between, its median area in front with a somewhat V-shaped sericeous or pubescent spot. Scutellum generally with a weak elevation on each side, its surface with longitudinal ridges behind, but the front part usually smooth. Surface of the postscutellum irregularly sculptured. Propodeal disk coarsely, quite transversely ridged everywhere, with punctures between, along the median band; the ridges continuous across the middle line; end with a large pubescent spot on each side of the petiolar attachment; sides coarsely ridged, the ridges running downward and only slightly forward, with punctures between and with short, erect, whitish hairs; beside the disk in front of the spiracle is a pubescent spot. Metapluron somewhat more finely ridged, the ridges running more forward, with fine punctures between and fine, erect hairs. Mesopluron partly concealed by a large, rather triangular pubescent spot below the rectangle and the front part of the meso-metaplural suture and behind the lower arm of the episternal suture; below the pubescence the plate is coarsely, not closely punctured and bears short ridges running almost vertically; the rectangle is marked with fine striae; episternal suture running nearly straight downward to about opposite the middle of the prothoracic lobe, then, rounding quickly backward for a time, comes to a point generally hidden by the pubescence, from which it passes forward and downward again, thus forming a widely open V; the mesopluron in front of this bears punctures and some vertical ridges.

Petiole: Black, its second segment sometimes piceous or seemingly tinged with very dark ferruginous though this is not common; first segment noticeably arched downward, as long or longer than the hind coxa and trochanter together, both segments shining.

Abdomen: Black except that the first segment may be piceous or rarely tinged with very dark ferruginous; surface minutely sericeous, rather broad.

Wings: Somewhat but not deeply fuliginous, darker beyond the veins, which are piceous; front of the second cubital cell usually very narrow; third cubital cell nearly always rounded behind, outwardly, and narrower in front than behind. Tegulae piceous.

Legs: Black, more or less grayish or whitish sericeous, particularly the tibiae and tarsi; coxae with a tendency to piceous, the hind pair, at least, sericeous above; hairs, spines and claws black.

MALE.—Clypeus and frons golden pubescent, less dense above; lower margin of the clypeus prolonged downward medially forming a blunt tooth, the area just around the base of which is reflexed, causing the tooth to project forward somewhat; side margins from the base of the tooth running outward and upward to below the base of the eye in nearly a straight line, being only slightly emarginate. Frons not much depressed medially. The trilobed condition at the top of the collar less strongly developed than in the female; the collar itself rising a little more erectly from the neck and its top broader in profile. On the last ventral abdominal plate there is a small, rather stout spine directed backwardly somewhat or slightly curved backward.

VARIATIONS.—Sometimes the ridges on the sides of the propodeum and on the metapluron run more vertically downward than usual. The legs, from the femora out may be slightly brownish. In some cases there is a trace of the cubital vein beyond the third transverse cubital. The pubescence beside the propodeal disk in front of the spiracle is very slight in some cases. Rarely the black on the abdomen may have a blue reflection.

LENGTH.—Females, 20-27 mm.; males, 18-26 mm. Over 250 specimens studied.

DISTRIBUTION.—I have seen specimens of this species from practically every State east of Montana, Wyoming, Colorado and New Mexico except the Dakotas, Minnesota and one or two from which I have seen practically no material. It has also been taken at Ottawa and Montreal, Canada. It is probably present everywhere in the United States east of 105° longitude. I have also seen specimens from Jacoltepec, Mexico and other (unnamed) Mexican localities; from Costa Rica; Surinam; Rio Grand do Sul, Esprito Santo and Rio Madeira, Brazil. Cameron records it from Valadolid, Yucatan. It is evidently a very widely distributed species, but does not seem to have crossed the more arid areas of the West and the Rocky Mountains.

In the Southern States this species appears quite early in the season. In Florida it has been taken May 2, July 15 and October 8; in South Carolina it has been taken June 5, and in Virginia June 27. In the middle latitude States like Virginia and Kansas it is found as late as the middle of October.

In general we may conclude that there are probably at least two gene-

rations (probably three) in the Southern, two in the middle States and one in the Northern States.

TYPES.—Cameron's description refers to both sexes. In the British Museum collection are eight specimens of this species gathered by the Biologia Expedition. One of these (a male) from the proper locality (Valladolid in Yucatan) is marked Type in Cameron's writing. One or more females from Valladolid are in the lot, but none of these is marked Type, though undoubtedly of Allotype and Paratype standing.

The type of Lepelletier's *Ammophila gracilis* has not been located. Some students of the group have believed *aurconotatus* to be a synonym of this, but as Lepelletier's description calls for "segmenti secundi petioliformi et partis dilatatae basi subtus fusce ferrugineis" which is not true of *aurconotatus* it is not probable that the two are the same.

10. **Sphex opulentus** (Guerin). (Fig. 16).

Ammophila opulenta Guerin, 1830, Duperry; Voy. Coquille, Zool., vol. 2, pt. 2, p. 261, female.

Large, black with black pilosity and white pubescence (golden on the male clypeus and frons). Pro- and mesonotum not ridged. Wings somewhat fuliginous. A prominent lateral projection is present on the lower, front part of the mesopluron. Chiefly South American.

FEMALE.—*Head:* Large, not quite quadrangular from above, the cheeks not projecting enough laterally; rounded oval from in front. Clypeus broad, only very slightly swollen centrally; rather more than the central third of the lower margin projects below the rest, this part being straight or shallowly emarginate, ending in a slight tooth, beyond which the margin turns sharply upward, then curves outward, followed by another emargination to below the eye; surface quite smooth below, near the middle; elsewhere with scattered punctures and shagreened; white sericeous, hardly pubescent and bearing long, black hairs. Frons with no median depression except the antennal fossa; rather finely, sparsely punctured, white sericeous at the sides half way up to the level of the ocelli. Vertex considerably higher than the ocelli, evenly rounded. Cheeks shining above, almost impunctured, white sericeous below and bearing long, black hairs.

Thorax: Collar narrow in profile, rising sharply from the neck to a narrow top, the front part of which has two oblique depressions which make it trilobed; surface of front and top somewhat black sericeous and bearing long, black hairs; lateral indented line very faint; gutter smooth, with a well developed ridge forming its front margin; prothoracic lobe partly (ever entirely?) supplied with white, sericeous hairs. Mesonotum rather densely covered by short, black, sericeous hairs concealing the markings beneath and with a few short, black, erect hairs. Surface of the scutellum quite smooth, with a pair of slight elevations and a median, depressed space between. Postscutellum rather smooth and shining. Propodeal disk dull on median band which narrows backward, but more shining laterally behind the spiracles, the band apparently bearing many very short, erect, dark and light hairs; the ridges nearly transverse, a little more oblique in front; end with a white, pubescent spot beside the petiole on each side; remainder more or less sericeous, concealing coarse ridges; sides covered by black, sericeous hairs and also rather dark, short, erect hairs, concealing behind, coarse ridges running downward, some crossing onto the metapluron; farther forward they bend forward considerably. Metapluron with coarse ridges running downward and many erect, black hairs. Mesopluron without ridges but with scattered punctures; a somewhat triangular, white, pubescent spot lies along the meso-metaplural suture, not reaching the episternal suture in front or the mesocoxal knob behind, its hairs seeming to curl spirally around a center; below this spot is a high, conical projection with a somewhat shining tip; surface of the plate with scattered, coarse punctures; rectangle somewhat coarsely ridged, the ridges running downward and slightly forward; episternal suture a widely open V, its tip backward.

Petiole: Long, black, the sides of the second segment sometimes slightly piceous.

Abdomen: Dull black, very finely black sericeous.

Wings: Slightly fuliginous, more so beyond the veins which are black; second cubital cell wide behind; third evenly rounded at its outer, back corner. Tegulae black, sometimes faintly white sericeous along the lateral margin.

Legs: Black, coxae somewhat whitish sericeous; hairs, spines and claws black.

Male.—More slender. Clypeus much prolonged below the eyes medially; its lateral margins running downward and inward from below the eyes in a nearly straight line to near the middle where a stout, blunt tooth projects strongly forward from the plane of the clypeus which is slightly depressed at the base of the tooth; clypeal surface densely golden pubescent as are also the sides of the frons half way up to the ocelli. Collar not narrowing upward much in profile, the oblique depressions on the upper,

front part in the female not showing (perhaps weak and concealed by the dense, black sericeous covering). Mesoplural projection not as strongly developed as in the female. There may be a bluish tinge or reflection to the abdomen, viewed at some angles. Abdomen more strongly whitish sericeous. Claws sometimes a little dull ferruginous near their tips.

I am not aware that the male has ever received any special description but it hardly seems necessary to designate an Allotype for the above.

LENGTH.—Females, 27-35 mm.; males, 25-26 mm. (those seen by me).

DISTRIBUTION.—This species is really South American where it reaches its greatest size, but the capture of a 31 mm. female at Los Amates, Guatemala, Feb. 7, 1905, and of a male in Cuba, brings it within the limits of this paper.

TYPE.—I have not seen Guerin's type of this species from Brazil, which, if in existence, is probably at Turin or Munich. It is a very distinctive species, however, not likely to be confused with any other, except possibly *miliaris*.

I have studied specimens from Paraguay, Brazil, Peru and Columbia in addition to those named above. Whether the label "Cuba" can be depended upon for that specimen I do not know. The lengths given above include the South American specimens. It is the largest species found in North America, though the single specimen known from that region may be exceeded, possibly, by other North American species.

11. **Sphex miliaris** (Cameron).

**Ammophila miliaris* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 3, Plate I, fig. 1, ♀ ; la ♂ ; female, male.

**Ammophila iridipennis* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 5, female, male.

Ammophila miliaris Melander, 1903, Psyche, vol. 10, pp. 160, 161.

Large, entirely black; well covered by a dense, black, sericeous clothing; pubescence silvery white, sometimes tending to golden; pilosity black; collar and mesonotum punctured, without ridges; wings only slightly fuliginous.

FEMALE.—*Head:* Quite broad from above but hardly quadrangular, the cheeks not projecting enough laterally; front deeply impressed at the antennal fossa but scarcely at all above. Clypeus rather short vertically, slightly raised transversely near its middle, its lower margin with a very

broad, slight, median emargination ending laterally in a narrow upward notch without angles, beyond which it rounds outward and gently upward before again turning outward below the eye; surface with fairly numerous, rather large punctures except near the lower part of the eye where it is smooth; slightly white sericeous. Frons with a few punctures, almost none above near the ocelli, its sides somewhat sericeous. Ocelli well below the vertex. Cheeks smooth above and also near the hind margin of the eyes; slightly sericeous below and with long, black hairs. Mandibles shining, piceous except for a faint, dark ferruginous cross band near the base of the teeth.

Thorax: Collar rising sharply from the neck in almost a straight line to a top narrow in profile and dropping quickly, behind; from in front two oblique depressions running upward and outward divide the front of the top into a median and two lateral lobes, but only slightly, if at all, modify the curvature of the back part of the top from side to side; lateral indented line absent or obsolete; gutter with a definite, raised front margin, its surface nearly or entirely smooth; surface of the collar quite densely black sericeous and with numerous, long, black hairs; prothoracic lobe quite strongly pubescent. Mesonotum densely black or dark brown sericeous; worn specimens show numerous punctures. Scutellum and postscutellum also densely black sericeous, the former in worn specimens showing traces of longitudinal ridges behind. Propodeal disk dull black, covered with short, black, sericeous hairs not concealing the ridges beneath, which run transversely and many of which cross the median line; end with a silvery sericeous spot beside, not close to the petiole but near the metacoxal knob; rest of the end with coarse ridges running downward, some rather wavy, and erect, black hairs; farther forward, on the sides, the ridges start downward, then bend forward, then downward again, while in front of the spiracle they continue somewhat forward; beside the disk in front of the spiracle is a white, pubescent spot. Metapluron ridged like the propodeal sides, with some of the ridges on the latter plate continuing across the suture; the metaplural ridges more irregular, those in front a little finer; triangle more finely ridged, the ridges running a little more forward. Mesopluron with an elongated, spindle-shaped, pubescent spot (varying somewhat in size and form) lying near, but not against the meso-metaplural suture, from the base of the mesocoxal knob to (generally) near the lower, back corner of the rectangle; exposed portion of the plate coarsely, sparsely punctured behind, and with long scratches; farther forward are weak ridges, also; behind the lower part of the episternal suture the plate projects outward, forming a somewhat conical, pronounced elevation bearing punctures and long hairs over its entire surface; rectangle finely, almost vertically ridged, with scattered punctures; episternal suture passing downward from the subalar area, then rounding backward to mark most of the lower end of the rectangle, then turning sharply forward and down-

ward in front of the conical elevation; almost all of this plate when viewed nearly parallel to its surface shows a very fine, silvery sheen.

Petiole: Long, black, its first segment much longer than the hind coxa and trochanter together.

Abdomen: Black; its surface very minutely black sericeous.

Wings: Slightly shaded with fuliginous; veins dark brown; second cubital cell very wide behind; third rounded at its outer, hind corner. Tegulae black, shining.

Legs: Black, the middle and hind coxae slightly whitish sericeous above; hairs, spines and claws black; hind tibiae slightly curved near the base.

MALE.—I have seen no male which I feel at all certain is that of this species. Cameron describes what he considers the male but he labels as Type only a female. There are three males in the British Museum collection but they bear only printed labels and are *Sphex melanarius* (Dahlb). Whether either of these is the one used by Cameron I do not know. *Melanarius* may prove to be the male of *miliaris*.

LENGTH.—Females, 22-29 mm.

DISTRIBUTION.—The only specimens I have seen of this species from places within the limits of this paper are those of the Biologia collection from Panama, Costa Rica and Guatemala. I have also seen specimens from Bolivia, Peru and Brazil but have seen very few.

TYPES.—Cameron described both sexes but makes one female only, the Type, though he gives three localities as places of capture. In the British Museum are seven females and three males from the Biologia collection. One of the females, from "Bugaba 800-1500 ft Champion" is marked "*Ammophila* miliaris Cam. Type BCAii3" in Cameron's writing and must be considered the type. A second female and one male are marked *miliaris* in Cameron's writing but only the one female named above has the word "Type." Neither male has any mark to show it was the one used in preparing the description of the male and probably all were used in any case.

Cameron described *iridipennis* apparently from two specimens in the Biologia collection, a female and a male, both from Zapote, Guatemala, and two such specimens are in the British Museum collection, both labelled in Cameron's writing and the female he marked Type. I find no characters in this female by which to separate it from *miliaris* and consider it as only a small specimen.

The male may be the same as those Cameron calls *miliaris* though I am not sure on this point. In any case its only relation to the female thus far, is that it was captured at the same place.

It is possible that Cameron was correct in regarding the male he describes as that of *miliaris* as being really the male of that species, but we have no proof of it. If this should prove to be correct *miliaris* will fall as a synonym of *melanarius* Dahlb.

12. **Sphex melanarius** (Dahlbom). (Fig. 15).

**Ammophila melanaria* Dahlbom, 1843, Hym. Eur., vol. 1, p. 15.
**Ammophila melanaria* Dahlbom, 1845, Hym. Eur., vol. 1, p. 431, female?, male.
**Ammophila miliaris* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 4, Plate I, fig. 1a, male.
?**Ammophila iridipennis* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 6, male.
?*Ammophila miliaris* Fox, 1897, Proc. Acad. Nat. Sci. Phila., p. 374, male.
Sphex melanarius Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 445, male.

Black, sometimes with a slightly bluish reflection on the abdomen. Pubescence golden on the head, white on the body. There is a very slight mesoplural lateral elevation behind the lower part of the episternal suture. Body covered, but not densely, with a short, erect, black (sometimes whitish) pilosity, longer on the head, front face of the collar and on the propluron, and short, golden pilosity mixed with the black, on the clypeus. Rather above the average size for the genus.

MALE.—*Head:* Quite broad, but the cheeks do not project enough laterally to give a quadrangular outline. Frons only slightly depressed medially. Clypeus long but not extending very far below the bottom of the eyes, its lower part bent slightly forward, its margin with a median point lateral to which is a broad, slight emargination reaching about two thirds of the distance from the point to the eye, beyond which the margin turns upward with a second emargination to below the eye itself, the angle between the two emarginations much more evident in some cases than in others; from near the base of the median point a long, black hair projects downward on each side—the only two, long, black hairs in that region though there are more near the top of the plate; clypeal surface densely golden pubescent and with a few short, fine, golden hairs, also. Frons

golden pubescent on its sides to a short distance above the antennal fossa; the rest of the surface with scattered, rather coarse punctures and erect, black hairs. Vertex showing only very slightly above the ocelli from in front; with scattered punctures and black hairs. Cheeks somewhat white sericeous close behind the lower half of the eye; rest of the plate with scattered punctures and long hairs. Mandibles shining, black, but generally with more or less of a dull ferruginous band across at the base of the teeth.

Thorax: Collar rising sharply from the neck, almost vertically, very narrow in profile and very flat in front, with little or no trace of the depressions dividing the front of the top as in *miliaris;* top quite evenly rounded from side to side but laterally becoming almost vertical down to the gutter; lateral indented line obsolete or entirely absent; gutter with a definitely rounded front margin extending down; gutter surface and the region around, smooth and shining; collar surface with numerous long, black hairs in front, turning upward; its top very finely golden sericeous in some lights; the top is somewhat lower where it turns down behind than in front; prothoracic lobe varying from quite densely white sericeopubescent to almost bare (worn specimens?). Mesonotum densely black sericeous, its surface, where visible, rather closely punctured and bearing black, erect hairs, shorter than on the collar. Scutellum with a few punctures in front, somewhat ridged longitudinally behind. Postscutellum confused, possibly with a few ridges behind. Propodeal disk rather coarsely, transversely ridged, the ridges crossing the median line; those behind the spiracles much finer outwardly than near the middle which is duller and apparently bears very fine, erect, black hairs; end with quite a large, white, pubescent spot between the petiole and the metacoxal knob; rest of the end with coarse transverse ridges which, curving down, become vertical when viewed from the side; sides similarly ridged, the ridges behind running nearly vertically down from the disk but those more in front running slightly forward; there is a white pubescent spot beside the disk in front of the spiracle. Metapluron similarly ridged, some of the ridges, at least, seeming to be continuous with those on the propodeal side; triangle coarsely ridged, the ridges running forward and downward, particularly toward their ends. Mesopluron with a somewhat spindle-shaped pubescent spot from the mesocoxal knob toward the base of the rectangle but not reaching it; remainder of the plate with scattered, coarse punctures behind, and sometimes a few ridges behind the lower part of the episternal suture; in this region there is a slight lateral swelling but no real elevation as in *miliaris;* rectangle rather less coarsely ridged than the propodeal side, the ridges passing downward and slightly forward and with punctures between them: episternal suture extending downward a short distance from the subalar area, then curving rather abruptly backward to mark most of the lower limit of the rectangle, then, forming a sharp angle, running forward

and downward, curving gently and extending well down toward the under side; most of the mesoplural surface is very minutely sericeous at some angles of view and bears short, erect, white hairs.

Petiole: Black, longer than the hind coxa, trochanter and femur together; faintly whitish sericeous.

Abdomen: Quite strongly curled downward; black; its first segment beneath, projecting downward below the general curve of the under surface and with a cross ridge at about three quarters of the length of the plate from the front, behind which the plate turns upward to regain the level of the general curve of the under surface; the sides also slope upward, giving to the more median part of the plate the outline of an oblong with sloping faces which projects down from the normal level of the plate from its front backward; this is very characterisitc of this species; last dorsal abdominal plate strongly emarginate, sometimes almost notched medially behind.

Wings: Slightly fuliginous; veins very dark brown, almost black; second cubital cell very wide behind; third evenly rounded at its outer back corner; second and third transverse cubital veins almost parallel. Tegulae black, shining.

Legs: Black, more or less whitish sericeous; spines and claws black.

FEMALE.—Unknown. It may prove to be *miliaris* which much resembles it.

LENGTH.—Males, 18—24 mm.

DISTRIBUTION.—The males of *miliaris*, so called by Cameron, which on examination proved to be *melanarius*, came from Panama and I have seen specimens from Costa Rica and British Honduras in Central America as well. In the Berlin Museum and at Lund are specimens certainly seen by Dahlbom (see below) from Brazil and I, myself, have studied specimens from Columbia and Peru. This indicates a wide range in northern South America as well as in Central America.

TYPES.—Klug published no descriptions of any of the species of Sphex or *Ammophila* of that day, but he did name specimens in the collection there. These names rank as museum labels, only, and have no standing. Dahlbom studied at the Berlin Museum and was of course familiar with these labels. They are on a bluish green paper and bear the scientific name in each case together with the letter N.

At the present time there is in the Museum, under the label "micans Cam." a male specimen labelled "Brasilien;" "4851;" "melanaria N," the last in Klug's writing. I was told by Dr.

Bischoff that Dahlbom must certainly have seen this. In Dahlbom's own collection at Lund is a male labelled "Brasilia Berl mus"; "melanaria Kl"; "Am binodis Fabr. certe: see Mus. Hafn. p 8½ Am melanaria K M 13 Dlbm. H. E. 15." The source of this last label I do not know, but the insect is certainly not *binodis* of which I have seen the type. Dahlbom in connection with his description of *melanaria* says: "Kl. Mus. Berolin sec Er." One of these two specimens is undoubtedly the one from which Dahlbom made his description, adopting Klug's museum label name to publish. This he also did in the case of five other Sphecids. It should also be noted that in the Fabrician collection at Kiel, arranged, named and numbered to correspond with his Systema Piezatorum, under "34 Pelopeus;" "8 abbreviatus" are two male specimens, of different species, the one standing first being *melanaria*. I have already discussed this situation elsewhere and to avoid an increase of synonomy have in accordance with the International Rules of Nomeclature, Article 31, selected the second specimen as the type of *abbreviatus*. This clears the way for the retention of the name *melanarius* and at the same time applies the name *abbreviatus* to what would otherwise be an unnamed species.

The striking feature of this insect is the peculiar swelling on the underside of the first abdominal segment which is very noticeable.

13. **Sphex nasalis** (Provancher).

Ammophila nasalis Provancher, 1895, Nat. Canad., vol. 22, p. 111, male.
Ammophila nasalis Melander, 1903, Psyche, vol. 10, p. 160.

Rather smaller than the average. Head, body, first petiole segment and part of the abdomen, black. Legs partly ferruginous. Wings nearly hyaline. Pubescence golden on the front of the head and mesonotum; elsewhere white. Pilosity partly white, partly black.

MALE.—Head rather oval than quadrangular from above, the compound eyes extending far back and strongly rounded. Median area of the frons quite strongly depressed. Clypeus long, bent strongly forward at about the level of the lower margin of the eyes; its lower margin running well down-

ward to a blunt point at the middle, the sides between the point and that below the eyes slightly, evenly, emarginate; clypeal surface densely golden pubescent, this continued upward on the sides of the frons nearly as high as opposite the anterior ocellus; pilosity apparently absent on the clypeus but present as rather long. slender, white hairs on the pubescent areas on the frons, both below and above the the antennal fossa; elsewhere on the frons they are black. Ocelli nearly as high as the vertex which shows but little above them; median depressed line on the frons evident up to the ocelli and forking there but there is no cross line behind them. Vertex evenly rounded from side to side. The occipital fossa extends far up. Cheeks not extending nearly as far laterally as the eyes and not projecting much backward, their surface black with a white sericeous band close behind the eye and with numerous, white hairs. Antennae dark brown, faintly whitish sericeous. Mandibles dark, dull ferruginous, almost a dull reddish brown.

Thorax: Collar broad in profile at its base, rising gradually and rounding quite evenly from the neck to its highest point where it is almost horizontal for a time before bending down quite suddenly to join the mesonotum; its lateral indented line quite sharp, passing around to near the top of the gutter; surface of the collar rather smooth, with a few fine punctures and rather fine, white hairs, and the top and sides down to the gutter very finely golden sericeous at some angles; gutter fairly well limited in front by a rounded ridge, its surface with a few fine lines; prothoracic lobe quite densely white pubescent. Mesonotum finely golden sericeous, almost pubescent beside the tegulae; with a few, fine, white hairs; surface shagreened and with numerous fine punctures, and fine transverse ridges toward the front corners. Scutellum quite smooth; with a pronounced median groove; slightly pale sericeous and with a few fine punctures. Postscutellum nearly smooth. Propodeal disk finely, transversely ridged; end with a large, pubescent spot on each side of the petiole and extending out to the metacoxal knob, up along the side of the disk near its end and across behind the disk to join its fellow; sides rather finely ridged behind, the ridges nearly vertical with rows of punctures between; farther forward the ridges disappear and the surface is closely punctured. Metapluron with a white, pubescent area covering the metacoxal knob and the depression below it, and extending forward to about under the propodeal spiracle along the propodeo-metaplural suture and tending to cross it in front, the area being somewhat triangular; remainder of the metapluron vertically ridged, with rows of punctures between; triangle finely, horizontally ridged. Mesopluron with a white pubescent band from the base of the mesocoxal knob and the depression in front of the mesocoxa, upward along the meso-metaplural suture to the lower, back corner of the rectangle; rest of the plate with vertical ridges, punctured between, the rectangle only very faintly ridged, mainly punctured; the whole plate faintly whitish seri-

ceous in some lights; episternal suture running down from the subalar area to about the middle of the prothoracic lobe where it sometimes makes a slight, forwardly projecting v before resuming its path downward to the underside of the body.

Petiole: First segment black, second ferruginous with more or less of a black median streak above.

Abdomen: Ferruginous with darker shades except possibly the last segment which may be partly or entirely black; its surface white sericeous.

Wings: Semihyaline, the veins brown; second cubital cell not particularly wide behind; third cubital cell with a definite right angle at its outer hinder corner. Tegulae piceous.

Legs: Coxae and trochanters black; femora black, or black tinged or spotted with ferruginous; tibiae similar but averaging more ferruginous; tarsi lighter, almost a dark ferruginous; spines lighter than the segments they are on in one case, darker in the other specimen seen; claws reddish ferruginous; entire legs quite sericeous with some places on the coxae almost pubescent.

LENGTH.—Males, 18 and 19 mm. (only two specimens seen).

DISTRIBUTION.—This species has thus far been taken only in California, and two of the three known specimens were captured in Los Angeles Co. The locality for the third is given simply as "Cala."

TYPE.—I have not seen Provancher's type which presumably is in the Museum at Quebec, but the insect is so different from any other known *Sphex* that I have no hesitation in considering the two specimens I have seen, this species. Variations in the distribution of the black on the abdomen are not significant.

Provancher states that his specimen was marked Los Angeles (Coquillett) (*). One of the specimens described above is labelled "Los Angeles Co., CAL-C*" and I suspect Coquillett captured two and sent one to Provancher and the other to the National Musum.

This and the male *Sphex aureonotatus* are the only two species of *Sphex* thus far found in the United States in which the lower mangin of the clypeus is acuminate. In no other way do these two closely resemble each other, however; *aureonotatus, melanarius, opulentus* and *miliaris* have the V-shaped episternal suture in common and all are black; *nasalis* does not have this form of suture and has ferruginous on its abdomen; yet the form of the clypeus is similar.

14. **Sphex aberti** (Haldeman). (Figs. 3, 25).

Ammophila aberti Haldeman, 1853, Stans., Exp. & Surv. Salt Lake, p. 368.

**Ammophila yarrowi* Cresson, 1875, Rept. geog. & geol. Explor. 100th Merid., vol. 5, p. 713, male.

Ammophila aberti Patton, 1879, Bull. U. S. geol. Surv., vol. 5, p. 553, female.

**Ammophila montezuma* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 13, Plate I, fig. 15, male.

Ammophila yarrowi Williston, 1892, Ent. News, vol. 3, p. 85, Habits.

Ammophila yarrowi Peckham, G. W. & E. G., 1898, Bull. 2, Wisc. geol. & nat. hist. Surv., p. 23. Habits.

Ammophila pruinosa Howard, 1901, The Insect Book, Plate VII, fig. 10, female.

Ammophila aberti Melander, 1903, Psyche, vol. 10, pp. 160, 163.

Ammophila yarrowi Melander, 1903, Psyche, vol. 10, pp. 160, 163.

Ammophila sp. Kellogg, 1905, Am. Insects, p. 493. Habits.

Sphex alberti Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 403.

Ammophila yarrowi Rau, Ph. & N., 1918, Wasp Studies Afield, pp. 215, 226. Habits.

Sphex aberti Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 449.

Sphex aberti Hicks, 1932, Can. Ent., vol. 64, p. 145. Habits.

A large black and ferruginous (of different shades) insect, with silvery white pubescence of varying amount on the head and thorax. Pilosity white. Collar nor mesonotum ridged. Legs more or less ferruginous, rarely black. Wings hyaline or nearly so.

FEMALE.—*Head:* Black, broad, slightly hour-glass shaped, viewed from above, the depression of the frons in front and the occipital fossa behind, narrowing it in the middle and the cheeks not projecting laterally, rounding the sides; from in front the vertex is too flattened and the clypeus and mandibles project too far down to give an oval outline. Clypeus broad, slightly swollen centrally; rather more than a third of its lower margin between the teeth, this portion somewhat reflexed forward and also projecting a little below the teeth; with a median notch, then sinuate to the teeth, beyond the base of which the margin runs outward and slightly upward to below the eye; clypeal surface often ferruginous on and a little above the margin; with scattered, coarse punctures and shagreened; more or less completely covered by pubescence and bearing long, slender hairs. Frons similarly covered even near the median line almost up to the ocelli; median depression strong, broad, and the indented line evident up to and enclosing

the ocelli, its side branches extending back a little behind the cross line. Vertex evenly, but rather flatly rounded, not high above, behind the ocelli, its surface white sericeous at some angles. Cheeks densely sericeous behind the eyes, even well up toward their top, and a broad belt there, narrowing downward; with numerous, long hairs. Antennae black, the scape often tinged with ferruginous and sometimes the tips of some of its other segments, also. Mandibles varying from black to dark at the base and on the teeth, but ferruginous elsewhere.

Thorax: Entire thorax except the propodeal disk densely covered by pubescence in extreme cases; much less covered, often, but generally showing traces, at least, of sericeous almost everywhere; worn specimens and those from certain localities have far less than the others. Collar, seen in profile, rising from the neck in an evenly rounded curve over the top, the hinder part of this being a little lower than the front part before it bends downward to become closely appressed against the mesonotum; this outline varying somewhat to a rather less curved, straighter ascent in front and a correspondingly narrower top; indented lateral line evident, entering the gutter obliquely near its top; gutter broad, smooth, with a low, rounded front margin; surface of the collar with scattered, fine punctures and erect hairs; generally too pubescent to show much of its characters; not transversely ridged; prothoracic lobe usually heavily pubescent. Mesonotum densely sericeous to pubescent but showing scattered, fine punctures and erect hairs and no transverse ridges. Postscutellum also sericeous, its surface confused. Propodeal disk sericeous and punctured along a median band, its sides shining and with rather coarse, oblique ridges; end with a pubescent spot from beside the petiole to the metacoxal knob and also upward becoming densely sericeous concealing all markings; sides pubescent to bare in different cases, in the latter condition showing irregular, rather dash-like, nearly vertical ridges and long, slender white hairs. Metapluron varying from densely pubescent, except its triangle and the part nearest, to only a pubescent band along the propodeo-metaplural suture going only part way forward from the metacoxal knob; its surface where exposed, with punctures and long hairs, its triangle finely punctured and possibly with a few fine ridges above. Mesopluron varying from pubescent everywhere to only a band along the meso-metaplural suture; the rest with coarse punctures and slender, white hairs; episternal suture slightly arched backward, ending about opposite the lower side of the prothoracic lobe.

Petiole: First segment black to reddish piceous, the second ferruginous with a varying amount of piceous as a median band above.

Abdomen: With varying amounts of color from ferruginous with a few black spots above, to considerable black above behind the first two segments though partly ferruginous below; in some cases practically all

the ferruginous on the abdomen is replaced by black (specimens from some parts of California).

Wings: Almost or entirely hyaline, the veins varying from reddish yellow to brown; second cubital cell a little wider than usual behind. Tegulae pale to dull ferruginous, often slightly sericeous.

Legs: Coxae and trochanters generally entirely black, the fore trochanter sometimes with a small ferruginous area, sometimes entirely ferruginous; other parts of the legs varying from all ferruginous to all black though in this last condition the outer parts of the fore and middle legs may have more or less of a ferruginous tinge; hairs light; spines of about the same color as the segments they are on; claws ferruginous, without teeth.

MALE.—Somewhat smaller and generally, at least, less ferruginous and more thickly pilose. Clypeus quite long, its margin varying from rather evenly rounded with a slight median notch, to a broad, shallow emargination beyond which it turns upward in a rather even curve, then out to below the eye; more or less of the entire margin may be very slightly reflexed; it quite closely resembles that of *Sphex transversus* but the curve upward in the latter is farther out toward the eye, the upward bend is sharper and the median portion is more truly transverse. The distribution of ferruginous as far as it is present is about like that of the female.

VARIATIONS.—This species varies greatly in different localities. It is largest and most brilliantly colored—a beautiful insect—in Western Texas, New Mexico, Arizona, Utah and Southern Colorado, at least, where the ferruginous is of a light shade. Farther north this becomes darker, more reddish, and slightly less abundant and there is less pubescence (see p. 22). This condition is also that found in North Dakota and westward to the Pacific Coast. The same general condition prevails in Oregon and Northern California. Farther south in the Coast States local variation seems to occur, some places producing specimens more like those from Arizona, though less brilliant, while in others the ferruginous almost or even entirely disappears and the pubescence is gray rather than white. These specimens look so different from the Arizona and also the northern forms, it seems hardly possible they can all be the same species. In parts of Mexico, though the colors remain strong, the average size of the insects is somewhat less. Six males in the National Museum collection from the Panamint Valley, California, differ so greatly in their color (which is entirely black or piceous), pubescence and pilosity (which is yellowish gray) as to make placing them in this species seem doubtful, and some specimens from Mexico which are similar, come in the same category. When a long series of specimens supposedly of this species, from all parts of its present known distribution can be brought together a further study of them will be most desirable.

Ridges on the scutellum, while usually absent in front of the middle, sometimes extend farther forward and may rarely cover the entire plate. One female from Modoc Co., California, which has come to my notice has its collar transversely ridged on top. There is also a ferruginous spot above the lateral line on the side of the collar and a larger one from the propodeal spiracle back along the disk, down to the petiole and out to the metacoxal knob and the abdomen is ferruginous, spotted with black like the *saevus* form of *procerus*. Ridges on the side of the propodeum run rather forward as in *procerus* but are absent on the metapluron, as in *aberti*. Another female, from Utah, has very faint traces of ridges on the collar and the mesonotum is strongly, coarsely, transversely ridged. The ridges on the side of the propodeum and their absence on the metapluron are in agreement with the condition on the specimen described above and the abdominal markings are those of *saevus*. A smaller ferruginous area on the side of the propodeum and end of the metapluron is also present. But in both the profile of the collar is that of *aberti*. These two specimens are very peculiar and suggest the possibility of a cross between the *saevus* form of *procerus* and *aberti*.

LENGTH.—Females, 19—30 mm.; Males, 21—26 mm. Over 300 specimens have been studied.

DISTRIBUTION.—I have seen specimens from every State west of the 100th. meridian except Wyoming from which I have no material, and from a few places a little east of that meridian in Texas, Kansas and North Dakota; it has also been taken in Southern Alberta, southern British Columbia, Lower California and Mexico (localities not given). Dates of capture run for Arizona between June 7 and November; Kansas, June to Sept. 7; North Dakota, August; Montana, July and August; Oregon, June and July; Washington, July 2 to Aug. 30; Alberta, June 30 and Aug. 7; British Columbia, July 19; Utah, Aug. 18 and Sept. 6; southern California, June to Sept.; northern California, July to November.

This would suggest the existence of at least two generations annually in the South and probably but one near its northern limits, though collecting continuously throughout the season has been too incomplete to give any adequate picture of the true condtions.

I have records of *aberti* having been taken on about half a dozen different species of plants.

TYPES.—Haldeman's type (apparently from Utah) has been lost and the same appears to be true of the specimen used by Patton in describing the female. Cresson described *yarrowi* from two male specimens taken in Colorado. Later he selected a type (Type No. 1930) and this is now in the American Entomological

Society collection. Cameron described *montezuma* from a male taken in northern Sonora, Mexico. This specimen, bearing the name and the word Type in Cameron's writing is in the British Museum. It is a rather small specimen.

This beautiful species deserves a much more thorough study than I have been able to give it.

15a. **Sphex breviceps breviceps** (F. Smith). (Fig. 14).

**Ammophila breviceps* F. Smith, 1856, Cat. Hym. Brit. Mus., vol. 4, p. 219, female.

**Ammophila varipes* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 457, female, male.

**Ammophila comanche* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 19, Plate I, fig. 4, male.

Ammophila breviceps Melander, 1903, Psyche, vol. 10, pp. 160, 163.

Ammophila comanche Melander, 1903, Psyche, vol. 10, pp. 160, 163.

Sphex breviceps H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 7.

Sphex breviceps Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 403.

Sphex breviceps Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 448.

Medium or less in size, the head, body and more or less of the abdomen and legs black, the rest ferruginous. Head and body quite thickly cinerous or whitish pilose. Pubescence white. Wings slightly fuliginous to nearly hyaline, sometimes with a weak violet reflection.

FEMALE.—*Head:* Slightly hour-glass shaped, viewed from above, the cheeks not filling out the posterior corners and a slight median depression on the frons and the top of the occipital fossa behind, constricting it somewhat medially. Outline from in front not at all oval, the vertex being quite flat. Clypeus somewhat swollen centrally; teeth dividing the clypeal margin about into thirds, the part between them slightly reflexed and sinuate; that lateral to them running outward and upward in a curve to below the eye; clypeal surface sericeo-pubescent, with medium sized punctures and long hairs; sometimes tinged with ferruginous on the lower margin. Frons similarly covered well up toward the eyes at the sides, the rest of its surface rather sparsely, finely punctured and bearing long hairs; median depression not very strong above the antennal fossa; with a fine but evident median indented line up and around the ocelli which are at the top of the head, the vertex not showing behind them. Vertex low, very flatly rounded from side to side, shagreened and with scattered,

fine punctures and long hairs. Cheeks white sericeo-pubescent behind the lower half of the eye margin; the rest with scattered, fine punctures and erect hairs, much longer below. Antennae black, somewhat tinged with ferruginous on the underside of the scape.

Thorax: Collar broad at base in profile, sloping upward rather gradually and turning gently backward to form a top of not great width which turns down rather quickly to join the mesonotum; the top with a median depressed spot near its hinder margin; otherwise quite evenly rounded from side to side; lateral indented line not very deep but evident, entering the gutter below its top; gutter rather broad above, with a few faint scratches; its front formed by a somewhat elongated higher portion above, which flattens out below; surface of the collar quite, though finely, sericeous; with fine punctures and long hairs; prothoracic lobe densely pubescent. Mesonotum quite densely, finely sericeous; its surface with medium sized punctures which near the front corners tend to form rows; with erect hairs, shorter than on the collar. Scutellum with scattered punctures and longitudinal to oblique ridges varying from almost absent to almost covering the plate. Postscutellum rather high centrally and shining; with scattered punctures. Propodeal disk with somewhat transverse ridges in front, more oblique behind; with a median band finely punctured between the ridges and somewhat sericeous; end with a pubescent spot on each side of the petiole base, extending up to the disk near its end but not crossing to meet its fellow, and extending outward onto the metacoxal knob; side densely sericeous, concealing all markings beneath. Metapluron similarly, but less densely sericeous, with a suggestion of a narrow pubescent band running forward a short distance from the metacoxal knob along the propodeo-metaplural suture; the exposed portions of the plate showing fine punctures and, like the propodeal side, many long, erect hairs. Mesopluron with a weak, pubescent band along the meso-metaplural suture from the mesocoxal knob to the top of the rectangle; the rest of the plate quite densely sericeous and thickly covered with punctures and long, erect hairs; episternal suture running nearly straight downward to the underside of the body.

Petiole: First segment black to dark ferruginous, longer than the hind coxa and trochanter together; second segment ferruginous except sometimes at its base.

Abdomen: Ferruginous with a varying amount of black posteriorly, sometimes covering parts or all of the last two or more segments; all more or less sericeous.

Wings: Somewhat fuliginous to almost hyaline, the veins reddish brown to almost honey yellow; hinder end of the second cubital cell somewhat wider than usual. Tegulae piceous to pale ferruginous, lighter behind.

Legs: Sometimes black but nearly always ferruginous, in which case the coxae are black, more or less sericeous to pubescent; the other segments varying from ferruginous to ferruginous mingled with dark streaks or spots; spines usually as light or lighter than the segments they are on; claws light.

MALE.—Body more densely pilose. Clypeus extended considerably downward, its lower margin narrowly reflexed, and its center with a moderately deep, rather narrow, rounded notch, lateral to which it runs outward, then upward, then turns outward again below the eye. Pilosity of the thorax usually dense enough to conceal any markings except the pubescent bands. There is often a dark, dorsal band on the second segment of the petiole. Abdomen more sericeous. Hind legs black or piceous and the others may be black also.

VARIATIONS.—This species is extremely variable and the extremes have been described as different species. The most hairy and larger form was described by Smith and again by Cresson; the smaller, heavily pubescent one was named *pruinosa* by Cresson and one can hardly believe that typical examples of these can be the same species. A series of specimens before me, however, showing every gradation from one extreme to the other obliges me to recognize only one species the extreme forms of which may be designated by varietal names though in many cases it is difficult to say whether a given specimen should be called the one or the other. For a more detailed statement of the differences see under *breviceps pruinosus* (p. 87).

The extreme *breviceps* is usually more black; is much more pilose; is larger and is more northern though I have seen both extremes from the same locality. *Pruinosus* is densely pubescent; with few and short hairs; it is usually considerably more ferruginous; smaller, and on the whole more southern in its habitat.

In some cases traces of ridges may be present either on the mesonotum, on the sides of the propodeum or on both. In a few cases I have seen, the top of the collar was pubescent. In some specimens from Colorado there seems to be a tendency toward golden pubescence.

LENGTH.—Females, 15—23 mm.; males, 14—21 mm. About 200 specimens studied.

DISTRIBUTION.—This form of the species is on the whole more northern than *pruinosus*. I have seen specimens from North Dakota, Montana, Wyoming, Washington, Oregon, northern and central California, Colorado, Nebraska, Kansas, and from high altitudes in New Mexico and Arizona, besides other States between those named.

Dates of capture range between July 23 and Sept. 4 in North Dakota; June 9 and Aug. 30 in Washington; July 4 and Aug. 10 in Oregon; June

13 and Sept. 11 in Nebraska; July 11 and Aug. 27 in Kansas; June 29 and Aug. 23 in Colorado; and June 28 in New Mexico. It has been taken on about half a dozen different species of plants.

TYPES.—Smith described this species from a single female from Mexico which, marked "breviceps Type Sm.," in Smith's writing, is in the British Museum collection. As it is the form usually found farther north it probably was taken at one of the higher altitudes of that country. Cresson's *varipes* was described from one female and ten male specimens from "Colorado Territory." Later the female was selected by him as the one to bear the type label (Type No. 1929-1). It is in the American Entomological Society collection.

This perplexing species may be restudied to advantage.

15b. **Sphex breviceps pruinosus** (Cresson).

**Ammophila pruinosa* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 455, female, male.

Ammophila pruinosa Melander, 1903, Psyche, vol. 10, pp. 159, 163.

Sphex pruinosus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 404.

Sphex breviceps Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 445.

A rather small insect, though larger examples equal small ones of *breviceps breviceps* in size. The chief distinctive features are:

In *pruinosus* the mandibles are almost always ferruginous out to the base of the teeth; the middle of the front margin of the clypeus is ferruginous or tends to be so and frequently this color may extend some distance up the middle of the plate; the legs are ferruginous except the coxae and these may be partly so; the petiole is usually entirely ferruginous; the abdomen is also ferruginous except for black or dark shades on the last two or three segments above; erect hairs are not abundant; and the pubescence is dense over the clypeus, frons and almost all the thorax.

In *breviceps* the mandibles are dark resinous to black; the center of the lower margin of the clypeus is usually black though sometimes tinged with ferruginous; the legs average ferruginous only from the middle of the femur out, and the hind pair are generally all black; only the second segment of the petiole is ferruginous and this is often black, at least above; the abdomen is ferruginous except the last two or three segments which may be wholly black or black only near the middle above and a trace of black on one or two segments below; erect hairs, generally quite long, are abundant giving the insect a somewhat "woolly" appearance;

pubescence is limited to a large spot on each side of the petiole base; a band varying in width from the hind coxa forward along the propodeo-metaplural suture and sometimes spreading onto the propodeum slightly; a band on the mesopluron from the mesocoxa to, or nearly to the base of the fore wing; more or less on the prothoracic lobe; and sericeo-pubescence on the clypeus, frons and coxae.

All conditions between these are met with and it is often impossible to say that a given specimen is one rather than the other.

LENGTH.—Females, 14—21 mm.; males, 13—19 mm. Many specimens studied.

DISTRIBUTION.—I have seen specimens of this form from Colorado, Utah, Nebraska (extreme western part), Arizona, New Mexico, southern California, Texas and Mexico. I have very few dates of capture, but those available seem to agree with those for the *breviceps* form.

TYPES.—This species was described by Cresson from ten female and three male specimens. One female was later selected by him as the type (Type No. 1933-1) and is in the American Entomological Society collection.

16. **Sphex harti** Fernald. (Fig. 4).

**Ammophila argentata* Hart, 1907, Bull. Ill. State Lab. Nat. Hist., vol. 7, p. 266. (nom. preocc.)

Sphex argentatus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 405.

Sphex (*Ammophila*) *argentatus* Rau, 1922, Trans. Acad. Sci. St. Louis, vol. 24, p. 24. Habits.

Sphex harti Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 450.

Head and thorax black; legs black, the outer segments tending toward piceous; first segment of the petiole black; second (darker at the base) and first three abdominal segments ferruginous, but often with dark spots or shades; rest of the abdomen black, often with a bluish reflection; pilosity, pubescence and sericeous hairs, white; wings hyaline, the veins light yellow toward the base, somewhat darker outwardly. Of about average size for this genus.

FEMALE.—*Head:* Quite broad, somewhat hour-glass shaped, the cheeks not being full either laterally or behind and the median depression of the frons and the top of the occipital fossa behind being evident though not strong; from in front the outline is hardly oval; eyes sometimes seemingly

convergent downward. Clypeus broadly, but not very strongly swollen; its lower margin with a smooth, narrow rim cut into medially by a notch lateral to which the edge of the rim runs outward, then slightly emarginate to a small tooth beyond which it runs outward and upward and finally outward below the eye; clypeal surface quite sericeous in fresh specimens, almost pubescent in the lower corners; with numerous fine punctures and long hairs. Frons similarly sericeous well up toward the top of the eyes and also well inward but not concealing the indented median line which is evident up to the front ocellus and forking, continues by the ocelli, but at most, with only the faintest trace of a cross line behind them; the surface not sericeous is rather sparsely, finely punctured and bears long, white hairs. Vertex hardly showing at all behind the ocelli, its outline broken at two places by the ocelli; its surface not sericeous, with scattered, fine punctures and erect hairs. Cheeks not full above, either laterally or backwardly and narrowing quickly downward; sericeous in a rather broad band behind and well up toward the top of the eye; in and behind this band are many, long, erect hairs.

Thorax: Collar broad at the base, rising rather quickly from the neck but rounding upward and backward and continuing on an even curve to the back side of the top where it turns down quickly; with a more or less defined median indentation on the top; its surface everywhere shagreened; with fine punctures not very close together, and bearing some sericeous and numerous, erect hairs; lateral indented line quite strong, running to the upper front part of the gutter which is sericeous, concealing any markings; front limit of the gutter an elongated, broad, rather low ridge; prothoracic lobe pubescent. Mesonotum without ridges, more coarsely and closely punctured than the collar, somewhat sericeous and with many, erect hairs. Scutellum often somewhat sericeous, with rather coarse punctures and sometimes with faint ridges on its sides behind. Postscutellum closely punctured and slightly sericeous. Propodeal disk quite sericeous on a longitudinal band the width of the disk in front but narrowing backward; its sides somewhat obliquely ridged; glossy black; end with a large pubescent spot extending from each side of the petiole base outward onto the metacoxal knob and upward to about the top of the petiole and well around toward the side, but not tending to cross to meet its fellow, this area above the petiole being sericeous; propodeal side and metanotum densely, evenly sericeous, concealing markings beneath, which in worn specimens are only fine punctures and shagreen; both plates have many erect, but not very long hairs. Mesopluron similarly sericeous but with a suggestion of a pubescent band along the mesometaplural suture from the mesocoxal knob to the base of the fore wing; episternal suture running nearly straight down to the underside of the body; beneath, except in front of the fore legs, densely sericeous.

Petiole: Quite long, its first segment black or piceous; second segment ferruginous except at its base and sometimes beneath where it is darker.

Abdomen: First, second and third segments varying in the amount of ferruginous present, the first usually all ferruginous, the second partly so, the third generally, but not always entirely black, and the remainder black; the surface very finely white sericeous or pruinose.

Wings: Hyaline, the veins near the base yellow, but more ferruginous outwardly; second cubital cell generally wider both in front and behind than usual in the genus, but not markedly so. Tegulae brownish, lighter behind, sericeous at least in part.

Legs: Black, the tarsi often tending to piceous; coxae heavily sericeous, particularly above; the other leg segments also sericeous; fore femoral hairs white; spines black except those on the last tarsal segments which are light; claws dull ferruginous outwardly, not toothed.

MALE.—Very similar but more densely pilose. Clypeus elongate, rather generally swollen but slightly depressed around the median line near the lower margin. Margin with a very narrow, forwardly reflexed rim; with a slight, broad, median emargination, lateral to which it curves very gently outward and gradually upward, later bending upward more, then outward below the eye, all the curves being slight at any place. Collar rising a little higher from the neck before rounding backward.

LENGTH.—Females, 15—23 mm.; males, 15—21 mm. About 500 specimens studied; many others examined more casually.

DISTRIBUTION.—I have seen specimens from Vermont, Connecticut, New York, New Jersey, Ohio, Illinois, Wisconsin, Minnesota, North Dakota, Montana, Alberta, Colorado, Nebraska, Kansas, Tennessee, Arkansas and Texas (extreme northern part) and one from Oregon which I am unable to make any other species though the locality makes it doubtful. From all the data obtained I judge that this species is collected in sandy regions, on sand dunes and similar places and am of the opinion that though widely distributed over the humid and not too hot portions of the United States it will prove to be quite localized within this territory. This may explain why no specimens from Massachusetts, Maryland, Virginia and other States have been taken, collectors not having happened to work at the right times in such places. Dates of capture indicate the probability of two, and probably three generations each year in some parts of its range. Thus, in Nebraska it has been taken on numerous dates between June 9 and Sept. 3; in New York between June 18 and Sept. 11; in Minnesota between June 24 and Sept. 25; and in Arkansas (one specimen) Oct. 27.

TYPES.—This species was first described by C. A. Hart in connection with his studies on the biology of the sand areas of Illinois, from one female and three males, now in the collection of the Illinois State Laboratory of Natural History at Urbana, Illinois. Only the female, from "Mason Co Ill.," was marked Type. The name he chose, however, had already been used by Lepelletier for a European species and I therefore proposed the name *harti* in the Annals of the Entomological Society of America, vol. 24, p. 450, to take its place. The types were loaned me for study by Professor Hart.

17. **Sphex willistoni** n. sp. (Fig. 37).

Of medium or smaller size. Head, body, first petiole segment, hinder part of the abdomen and the legs, black, the abdomen with a bluish reflection. Pubescence white, sometimes tending toward golden. Pilosity black on the head and prothorax, white, scanty and short elsewhere. Wings slightly fuliginous.

FEMALE.—*Head:* From above rather quadrangular, the frontal depression weak though the cheeks are hardly full enough to give a good quadrangular outline; from in front broadly oval, almost approaching circular in outline. Clypeus slightly swollen centrally, not projecting far below the base of the mandibles, its teeth dividing the lower margin into a median half and lateral quarters, with a rim bearing a few, fine punctures, quite transverse on about its central portion, then beyond the teeth turning upward, then outward and upward in an even curve, and finally turning outward again below the eye; the teeth are sometimes reduced to mere points and difficult to see; clypeal surface white or slightly golden pubescent, shagreened, with scattered, fine punctures and a few erect hairs. Frons similarly pubescent along its sides but not very far up; surface shagreened, with scattered, fine punctures and hairs; median indented line evident in the only slightly depressed front up to the anterior ocellus and at the sides and across behind the ocelli which form nearly an equilateral triangle. Vertex low, showing but little behind the ocelli, its surface shagreened and with a few fine punctures. Cheeks sericeous from the eye margins quite far back toward the occipital fossa and well up toward the top of the eye; with fine punctures and long hairs, particularly below and toward the neck.

Thorax: Collar rising somewhat obliquely from the neck, either somewhat curved or nearly flat at first, but rounding gently above to form a

top, rounded in profile and curving down somewhat behind before turning quickly downward to form its hinder face; the profile forms nearly, but not quite, a quadrant; it has no median indentation at the back of the top and is evenly rounded over the top from side to side; lateral indented line weak; surface whitish sericeous over the top, in front and on the sides to the upper end of the gutter which is rather wide and shallow, slightly, finely ridged; with a fairly developed front margin which is finely ridged; propluron sericeous, with long, erect hairs, particularly near the pronotum; prothoracic lobe quite densely pubescent. Mesonotum quite sericeous everywhere, its surface shagreened and with scattered punctures. Scutellum nearly smooth, with a few fine punctures and possibly very faint ridges behind; with a weak median depression. Postscutellum with a slight central, transverse ridge; sericeous. Propodeal disk apparently with a median longitudinal ridge across which some of the side ridges continue; the anterior ridges transverse, becoming oblique farther back, and bending outward more, behind the spiracle, but transverse again near the tip; along the middle, front to rear, is a rather indefinite band where there are punctures between the ridges and which bears short, erect hairs; end with a pubescent spot from beside the petiole out to the metacoxal knob; upward it becomes sericeous and more or less crosses above the petiole to meet its fellow; this region bears rather long hairs and its surface, where exposed, shows ridges running across the end, their ends running about vertically downward; sides somewhat irregularly ridged, the ridges running downward; with some punctures and hairs; there is a trace of a sericeous spot beside the disk between the spiracle and the postscutellum. Metapluron with a pubescent band from the metacoxal knob along the propodeo-metaplural suture to beyond opposite the spiracle but not reaching the triangle; remainder of the metapluron coarsely, rather closely punctured, more or less sericeous, as is also the hollow in front of the coxa, and bearing numerous, quite long hairs; triangle finely ridged, forward and slightly downward. Mesopluron with a rather heavy, narrow, pubescent band from the mesocoxal knob along the suture to, and onto the lower back corner of the rectangle and a little upward on its hinder margin; rest of the plate somewhat thinly sericeous, less closely punctured than the metapluron but about as coarsely, and with long, erect, fine hairs; episternal suture running straight down to the underside of the body; behind it is a small, wedge-shaped depression not connected with it which marks a part of the lower limit of the rectangle; entire under surface of the thorax somewhat sericeous.

Petiole: Hardly as long as the hind coxa, trochanter and femur together; its first segment black to faintly resinous; the second ferruginous except for a touch of black at its base, above; both segments somewhat sericeous.

Abdomen: First and second segments ferruginous,, sometimes, at least, with dark shades; remainder black with a bluish reflection.

Wings: Slightly fuliginous; veins brown; second cubital cell quite broad; second and third transverse cubital veins meeting or nearly so on the radial vein, thus giving the third cubital cell nearly a triangular outline. Tegulae very dark brown, almost black; shining.

Legs: Black, the tarsi sometimes a little lighter; slightly sericeous; coxae sericeous to pubescent above; hairs and spines black; claws reddish outwardly; without teeth.

MALE.—Unknown or unrecognized. It may possibly be *Sphex peckhami* n. sp.

LENGTH.—Female, 17—19 mm. Only two specimens seen.

DISTRIBUTION.—Meadow Valley, Mexico. No dates of capture given.

TYPES.—Described from a Holotype and a Paratype in the United States National Museum collection from Meadow Valley, Mexico.

This may possibly prove to be *Sphex nigrocaeruleus* (Cam.) but I doubt it.

I take pleasure in naming this species for Prof. S. W. Williston who first reported an insect (*Sphex aberti*) as using a stone as a hammer in filling up its burrow.

18. **Sphex peckhami** n. sp. (Figs. 19, 35).

Of about medium size; rather slender; black except more or less of the second petiole segment and most of the first and second abdominal segments which are ferruginous. Pubescence white, sometimes tending toward golden. Erect hairs white to golden, matching the pubescence except on the upper part of the frons and on the vertex where they are black; rather short and not dense except on the head. Wings semihyaline to slightly fuliginous.

MALE.—*Head:* Sides quite evenly rounded, seen from above, but lack of any marked median depression in front or behind prevents calling the outline hour-glass shaped. Clypeus extending about one-third of its length below the eyes, its lower part quite flat, rarely bent slightly forward; its lower, central, slightly reflexed margin varying from a pronounced median emargination—almost a notch—with a rounded projec-

tion on each side, to a very faint emargination practically without any projections; lateral to this in either case the margin runs strongly upward and outward in a weakly sinuate line, turning outward finally under the eye; surface rather heavily pubescent; occasionally there is a median depression on the lower fourth of the plate; the hairs white or golden. Frons pubescent on its sides part way up to the level of the front ocellus, generally not pubescent in the middle above the antennal fossa; median indented line evident when not hidden by the pubescence, but not deep, forking at the front ocellus and generally continuing back behind the lateral ones; only sometimes with an indented line behind them; surface when not concealed, shagreened and with erect, black hairs. Posterior ocelli practically as high as the vertex behind them; farther apart than from the anterior one. Vertex surface like that of the frons, evenly rounded from side to side. Cheeks somewhat sericeous behind the eyes and bearing long, whitish hairs. Mandibles black, but usually with a resinous tinge.

Thorax: Collar wide at its base in profile, rising rather sharply from the neck, but evenly rounded upward and backward to its highest point, then continuing the curve a short distance to where it turns quickly downward in front of the mesonotum; sometimes with a trace of a median depression at the back of the top; evenly rounded from side to side; lateral indented line not strong, extending to the gutter near its top; surface of the collar a little whitish to yellowish sericeous and also often present in the gutter; where this is worn off the surface is shagreened and has scattered, fine punctures and rather short, erect hairs; gutter with more or less of ridges; prothoracic lobe quite heavily pubescent. Mesonotum weakly sericeous, longest near and in front of the tegulae; sparsely, finely punctured. Scutellum rather flat, its surface quite smooth and shining; with a median, depressed line; rarely very finely ridged near its hinder corners; finely, sparsely punctured. Postscutellum somewhat high in the middle, punctured elsewhere. Propodeal disk rather coarsely, obliquely ridged except its very front, seemingly with a median longitudinal ridge in front and a median band which is punctured and bears fine, erect hairs; end with a pubescent spot extending from beside the petiole onto the metacoxal knob and upward to above the petiole and sometimes joining its fellow below the end of the disk; side with medium sized punctures, tending behind to form rows running down and slightly forward, but farther forward with weak ridges forming between the rows; entire surface tending toward sericeous. Metapluron with a pubescent band from the metacoxal knob forward along the suture, extending to below the spiracle or sometimes nearly to the triangle and also covering the hollow in front of the metacoxa; rest of the metapluron

with punctures of medium size and fairly close together; triangle finely ridged, the ridges more nearly horizontal than those on the sides of the propodeum. Mesopluron with a pubescent band from on the mesocoxal knob along the meso-metaplural suture onto the rectangle, a varying amount of which is covered from almost none to nearly all; rest of the plate sericeous, varying greatly in degree, sometimes almost pubescent; bottom of the rectangle chiefly marked by a horizontal indentation, widest behind, apparently not connected with the episternal suture which runs nearly straight down from the subalar area to the underside of the body; exposed surface of the mesopluron, if any, shagreened, sparsely, finely punctured; entire under surface of the thorax usually quite densely sericeous.

Petiole: Longer than the hind coxa, trochanter and femur together; its first segment black; its second ferruginous except dark near its base and sometimes a dark dorsal streak a short distance.

Abdomen: First and second abdominal segments ferruginous but usually with a black dorsal spot or streak posteriorly on each segment, the second sometimes black above and on its sides on its hinder half; remaining segments black, often with a bluish reflection; petiole and abdomen very finely sericeous.

Wings: Slightly, evenly fuliginous; veins brown; second cubital cell rather wider than the average; third cubital cell varying but narrow in front and tending toward triangular. Tegulae dark but hardly black, sometimes a little sericeous in front.

Legs: Black; coxae pubescent above; the other leg segments sericeous; spines black, lighter toward their tips in some cases; claws resinous to reddish outwardly.

FEMALE.—Unknown; possibly *Sphex willistoni* n. sp.

LENGTH.—Male, 16—20 mm. Ten specimens studied.

DISTRIBUTION.—Elkhorn Mts., Montana, July; Virginia Dale, Colorado, July 24; San Francisco Mts., Arizona, July 14; Meadow Valley, Mexico.

TYPES.—Described from the Holotype and three Paratypes from Meadow Valley, Mexico, in the United States National Museum collection and one Paratype from the same place in my own collection.

Named *peckhami* in recognition of the fine studies on the habits of the solitary (and other) wasps made by Professor and Mrs. Peckham which have become classic papers in the group.

19. **Sphex craspedotus** n. sp. (Fig. 12).

Head, body, first segment of the petiole, and the basal segments at least, of the legs, black; remainder ferruginous. Pilosity, pubescence and sericeous hairs white. Wings slightly fuliginous. Rather below average size.

FEMALE.—*Head:* Broad but hardly quadrangular or hour-glass shaped, viewed from above. Eyes covering three-fourths of the side of the head from front to rear. Clypeus strongly swollen centrally, its lower margin without teeth but with a smooth, broad rim everywhere, its outline varying somewhat but in general with a median notch, lateral to which it extends a short distance transversely, then runs upward and outward in a gentle curve to below the eye; clypeal surface shagreened, densely sericeous to pubescent except the rim; with scattered punctures and long, erect hairs. Frons broadly but only slightly depressed above the antennal fossa; its median indented line quite strong up to the front ocellus; its forked part weaker and the cross line behind the ocelli sometimes present, sometimes lacking; frons surface shagreened, rather finely punctured, with many fine, erect hairs; its sides sericeo-pubescent in a narrow band along the inner margins of the eyes and extending well up toward the level of the front ocellus. Ocelli forming nearly an equilateral triangle; lateral ocelli as high as the vertex behind them. Vertex flatly rounded from side to side, shagreened, with scattered, fine punctures and hairs. Cheeks somewhat broad behind but not full laterally; densely sericeo-pubescent well up toward the tops of the eyes; bearing many long, erect hairs, particularly behind and below. Antennae black, the scape sometimes tending toward ferruginous below. Mandibles black but frequently tending toward resinous or ferruginous near the middle.

Thorax: Collar rather broad at its base, sloping upward in an even curve to its top where it turns down in an abrupt curve against the mesonotum; with a trace of a median depression at the back of the top; evenly rounded from side to side; lateral indented line quite sharp and distinct to the middle of the gutter which it enters at the upper part; the gutter with weak ridges (or aciculations?) along it; collar surface shagreened, pale brownish to whitish sericeous above; rather sparsely, finely punctured and bearing long, fine, erect hairs; its sides more shining; prothoracic lobe densely pubescent. Mesonotum shagreened; with punctures, medium both in size and abundance and tending, particularly in front, to form transverse rows and in some cases there are very weak ridges; sericeous hairs weakly brownish or paler, and the fine, rather short, erect hairs are brown to white; there is usually a pubescent band just inside the tegulae. Scutellum nearly smooth to weakly longitudinally or obliquely

ridged and with a few fine punctures. Postscutellum with a transverse ridge in its middle and possibly a few faint, oblique ridges at its sides; the rest confused. Propodeal disk with a median band narrowing very little backward, which is finely punctured between fine, nearly transverse ridges, and also whitish sericeous; lateral to the band, behind the spiracle the ridges become more distinct and this portion more glossy; end entirely covered by pubescence extending laterally onto the metacoxal knob and up to the sides and end of the disk, the upper portion being more nearly heavily sericeous than pubescent; propodeal sides finely, nearly vertically, somewhat irregularly ridged and with fine punctures and erect hairs; from the metacoxal knob and beneath, in front of the coxa, a pubescent band runs up and forward, partly on the metapluron, partly on the side of the propodeum to below the spiracle where it becomes wholly propodeal and continues to the side of the disk between the spiracle and the postscutellum; the part of the metapluron not thus hidden, finely, sparingly ridged, with fine punctures between, the very faint ridges which are sometimes lacking, running downward and backward if not vertically; triangle covered, at least above, with very fine ridges running nearly horizontally. Mesopluron varying in pubescence from a band starting on the mesocoxal knob and the depression in front of the coxa and running up on the mesopluron along the meso-metaplural suture over the rectangle to the subalar area, to a widening forward of this band to cover the greater part of the plate behind the episternal suture, this area being largely sericeous when not pubescent; exposed part of the plate bearing medium sized punctures, not very close, and long, erect hairs: in fact the whole body side is well, though not densely, covered with these hairs; episternal suture running straight down to the underside of the body.

Petiole: First segment black; second ferruginous but darker (black?) at its base and sometimes with more or less of a dark, median, dorsal streak.

Abdomen: Segments ferruginous with black shades or spots here and there, particularly on the third and fourth above and on varying ones beneath; the last segment, however, entirely ferruginous; surface (as also of the petiole) whitish sericeous.

Wings: Slightly fuliginous, the veins brown; second cubital cell of medium width behind; second transverse cubital vein straight or almost so; third joining the radial vein only slightly beyond its middle. Tegulae dull brown.

Legs: Black or nearly so at base, tending toward dull ferruginous outwardly; white sericeous, the upper surfaces of the coxae even pubescent; spines about the color of the segments they are on; hairs long, white; tarsal comb composed of long white hairs rather than spines; claws ferruginous.

MALE.—Unknown or at least unrecognized.

LENGTH.—Females, 15—19 mm. Eight specimens studied.

DISTRIBUTION.—This species has thus far been taken only in California, the localities recorded being: Ingleside, Pacific Grove, Burbank and "Los Angeles Co." Dates of capture are June 26, August 3 and August 28.

TYPES.—Described from a Holotype and six Paratypes: the Holotype and two Paratypes (all from Los Angeles Co., Cal.) in the United States National Museum collection; one Paratype from "Ingleside Cal. 28 Aug. 1908. J. Chester Bradley" in the Cornell University collection; one from Pacific Grove, Cal., in the collection of Dr. W. M. Mann; one from Burbank, Cal., in the collection of Prof. Charles H. Hicks of the University of Colorado, who has studied its nesting habits, and one, also from Burbank, in my own collection.

This interesting species is the only one I have seen from North America in which there are no teeth or even traces thereof on the lower margin of the clypeus, in the female. Other species may have more or less of a smooth rim on all, or at least a part of the margin (e. g., *chiriquensis* between the teeth), but in this species it is remarkably wide and unbroken. Another unusual feature is that while segments farther forward may be quite dark, the last abdominal segment in each of the eight specimens seen was entirely ferruginous.

20. **Sphex nigricans** (Dahlbom).

**Ammophila nigricans* Dahlbom, 1843, Hym. Eur., vol. 1, p. 14, male.

Ammophila nigricans Dahlbom, 1845, Hym. Eur., vol. 1, p. 430.

?*Ammophila procera* Lepeletier, 1845, Hist. Nat. Ins. Hym., vol. 3, p. 376, female.

?*Ammophila intercepta* Lepeletier, 1845, Hist. Nat. Ins. Hym., vol. 3, p. 378, female.

?*Ammophila intercepta* Cresson, 1872, Trans. Am. Ent. Soc., vol. 4, p. 210.

Ammophila nigricans Melander, 1903, Psyche, vol. 10, pp. 157, 161.

Sphex nigricans H. S. Smith, 1908, Univ. Neb. Studies, vol. 8, p. 330.

Sphex nigricans Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 402.

Sphex (*Ammophila*) *nigricans* Rau, 1926, Trans. Acad. Nat. Sci. St. Louis, vol. 25, p. 211. Habits.

Head, thorax, first petiole segment, abdomen except the first segment, and the legs, black. Pilosity black. There is more or less of a sericeous covering, also black. Wings deeply fuliginous. Rarely there is a trace of white pubescence on the prothoracic lobe and on each side of the base of the petiole articulation. Pro- and mesonotum not ridged. Claws without teeth.

FEMALE.—*Head:* Broad, rather quadrangular from above, the cheeks projecting outward nearly as far as the eyes and full behind; front not depressed medially, even near the antennal fossa; from in front broadly oval in outline. Clypeus quite broadly but not strongly swollen, with a definite circular depression below the middle; its surface shagreened, rather coarsely punctured and bearing long hairs; lower margin divided about into thirds by the weakly developed teeth, with a faint emargination between them, and an upward, short curve beyond, the margin then running nearly horizontally outward for some distance before turning upward and again outward below the eye. Median indented line of the frons evident but not deep; forking before the front ocellus and extending a little behind the indented cross line behind the ocelli. Vertex quite high above the ocelli, rather flatly rounded from side to side. Cheeks smooth close behind the eyes except for slight shagreen. Frons, vertex and cheeks, other than behind the eyes, sericeous, with erect hairs not very long on the frons and vertex.

Thorax: Collar not narrow in profile at its base, rising at a quite uniform slope to the top which is not narrow, and rounded in front and behind; its sides also somewhat rounded; lateral indented line quite strong, running to the upper front corner of the gutter which is smooth and has a somewhat low, broad ridge as its front margin; collar surface quite thickly sericeous, particularly above; prothoracic lobe well covered by erect hairs and sometimes with short, white, sericeous ones along its hinder margin. Mesonotum quite densely sericeous and with many short, erect hairs. Scutellum less sericeous; with scattered punctures and traces of fine longitudinal ridges behind. Propodeal disk dull black, shagreened, only slightly sericeous, with distinct ridges, mostly about transverse, and many continued across the median line; end with ridges crossing above the petiole and turning down on each side to a vertical direction or slightly forward; disk, end and side with many short, erect hairs; on the sides the ridges seem to become finer, more irregular, less continuous and appear to reticulate somewhat; this condition continues on the metapluron above, but lower down, near the mesocoxae the ridges are more regular and run more forward as well as downward; triangle finely, not very closely ridged, the ridges running downward. Meso- and metaplura less

sericeous than the other plates, the latter with many medium to coarse punctures; at some angles on this plate as elsewhere the sericeous covering seems to be composed of dark brown, rather than black hairs; rectangle with faint, fine ridges running obliquely downward, with punctures between; episternal suture passing straight down to beneath the body.

Petiole: First segment black; second usually black or piceous in front, ferruginous behind.

Abdomen: First segment ferruginous except its hinder margin which is black like the rest of the abdomen; this portion minutely black sericeous or pruinose; sometimes the abdomen has a bluish reflection.

Wings: Deeply fuliginous; veins dark brown; second cubital cell not very wide behind; second recurrent vein liable to be nearly interstitial with the second transverse cubital. Tegulae black, somewhat paler behind.

Legs: Black; hairs and spines black; claws black at base, tinged with dark ferruginous outwardly; surfaces shagreened and the tarsi sometimes appear pale sericeous, in which case the smaller spines there are lighter colored.

MALE.—Differs little from the female. Clypeus projecting considerably below the eyes; rounded laterally but quite flat in the middle, below; its lower margin shallowly emarginate over about its middle third, lateral to which it rounds quite evenly outward and upward to below the eyes; its surface often white sericeous; prothoracic lobe sometimes with traces of white pubescence and a similar sericeous or pubescent spot is frequently present beside the petiole articulation. Metapluron rarely at all ridged, but the punctures frequently form rows. The second petiole and first abdominal segments often are nearly all piceous to black. Legs sometimes whitish sericeous.

LENGTH.—Females, 21—29 mm.; males, 18—26 mm. Over 500 specimens studied.

DISTRIBUTION.—This species has been taken in all the Atlantic Coast States from New Hampshire to Florida and in Mississippi, Louisiana and Texas. More northerly, I have seen specimens from New York, Ohio, Indiana, Illinois, Tennessee, Missouri, Kansas, Nebraska and Minnesota: also a few from New Mexico, Arizona, Colorado, North Dakota, Oregon and California, but which I did not have an opportunity to study carefully. Therefore I am not sure they are really this species. *Consors* and *trichiosomus*, both southern and southwestern species, greatly resemble *nigricans* and it is possible that the specimens from these last named localities belonged to one or both of these species.

Two males from North Dakota seem undoubtedly to be *nigricans*, but no females have thus far been reported from that State though I have seen considerable material from there.

Dates of capture appear to begin in February and continue till about the end of October in Texas; in North Carolina the range is from late May to the first of October; in Virginia from early June to the end of August; in Massachusetts from late June to the end of September; and in Nebraska from June 13 to September 14, according to Mickel. It would seem probable that there may be three generations each year in the more southern states and probably two in southern New England, though data are so scanty that this must be largely conjectural.

TYPE.—In the Berlin Museum is a male specimen labelled "nigricans Dahlb. Am. Sept.;" "N. America" in a writing believed by the custodians there to be Dahlbom's. I found no specimen labelled *nigricans* in Dahlbom's own collection at Lund, so this is probably the one from which the description was made. I was unable to find any specimens labelled *procera* or *intercepta* by Lepelletier in any of the European collections I saw, so, as the descriptions themselves are vague, I can consider them as only possibly of this species.

This fairly common insect over most of the United States is easily distinguished from all others found in the northern and eastern states by its rather large size, very dark wings, black head, body and legs and by having little or no pubescence. Specimens from the Southern States west of the Mississippi River, though, will require careful examination to distinguish them from *trichiosomus* and *consors* and it is possible that some examples from the South and Southwest named *nigricans* by me several years ago, before I had studied the three carefully, may have been incorrectly named. Specimens from California should also be studied with care.

21. **Sphex consors** (Cameron). (Fig. 28).

**Ammophila consors* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 12, Plate II, fig. 3, female, male?

Ammophila consors Melander, 1903, Psyche, vol. 10, pp. 161, 162.

Black except the second petiole and more or less of the abdominal segments which vary from rather piceous to ferruginous. Legs black, sometimes tending toward piceous outwardly. Pu-

bescence white; pilosity black. Body slightly sericeous in some regions. Wings quite, but not deeply fuliginous. Insects of medium or slightly larger size.

FEMALE.—*Head:* Rather quadrangular from above, the cheeks extending laterally nearly as far as the eyes and also well backward; broadly oval from in front, the clypeus somewhat longer than in many species. Clypeus rather swollen centrally, its surface sparsely whitish sericeous to pubescent; shagreened and with numerous coarse punctures and long erect hairs; teeth on the lower margin rather near each other, the rim between them often quite wide so that this portion projects considerably below the sides; lateral to the tooth the margin turns upward sharply, then outward rather sinuately to below the eye; the entire margin is somewhat variable, however. Frons sericeous to pubescent at its sides well up toward the ocelli; less closely but more finely punctured than the clypeus and the erect hairs are smaller; somewhat broadly but not deeply depressed between the eyes; median indented line evident, forking at the front ocellus and with a connecting cross line behind. Vertex rather high behind the ocelli, somewhat flatly rounded from side to side; its surface shagreened and with a few punctures and hairs. Cheeks shining, sometimes with a trace of whitish sericieous behind the eyes; with punctures, larger and more abundant, below. Mandibles black to piceous.

Thorax: Collar sloping up from the neck, its top fairly broad, rounded in front, turning down a little more sharply behind, evenly rounded from side to side; its surface punctured, sometimes white sericeous and with long hairs in front; lateral indented line meeting the gutter at or near its top; gutter smooth to rather strongly ridged in which case the ridges may continue above the indented line; prothoracic lobe white pubescent, varying in amount. Mesonotum thinly whitish to brownish sericeous; with fine punctures and short hairs. Scutellum generally quite smooth, with traces of fine ridges behind (sometimes quite strongly ridged at the sides) and a slight median depression. Postscutellum usually rather shining; with some fine punctures. Propodeal disk quite uniformly, coarsely ridged, the ridges everywhere running outward and backward, their outer ends behind the spiracle turning more outward; a median band is somewhat punctured and often bears numerous, short, erect, white hairs; in some cases the ridges are more transverse and the surface shagreened, giving the disk a duller appearance; end with a white pubescent spot on each side of the petiole, which extends up tending to meet that from the other side, and also out over the metacoxal knob; ridges on the end are in the form of inverted U's; sides quite irregularly, weakly ridged, the ridges in general running downward, sometimes slightly forward;

surface somewhat blackish sericeous and with short, erect hairs which are whitish in some cases. Metapluron irregularly ridged downward and slightly forward, punctured and with short, erect hairs; sometimes white sericeo-pubescent hairs suggest the tendency to form a sericeous or pubescent band along the propodeo-metaplural suture from the hind coxal knob forward. Mesopluron not ridged; coarsely, rather closely punctured in front, less so behind; with a white pubescent band from the mesocoxal knob along the meso-metaplural suture to, or nearly to, the base of the rectangle and frequently broadening below to become more nearly a triangle; episternal suture running down to the underside of the body.

Petiole: First segment black, slightly longer than the hind coxa and trochanter together; second segment ferruginous with more or less of a dark, median, dorsal stripe.

Abdomen: The first segment may be ferruginous with a dark hinder border and the rest of the abdomen black; from this condition we have all intermediate ones to where the first, second, third, and the underside of the fourth segment are ferruginous with clouds of darker here and there; sometimes the black of the abdomen has a faint bluish tinge.

Wings: Quite fuliginous, sometimes with a slight yellowish tinge; veins resinous to dark honey color; second transverse vein usually straight; second cubital cell generally nearly right angled at its hinder, outer corner; not very wide behind; third cubital cell often almost triangular. Tegulae shining, piceous, a little lighter behind.

Legs: Black, spines and hairs black; coxae sometimes white sericeous above and the trochanters, femora and tibiae are liable to show traces of this; outwardly the legs may become more piceous; claws light reddish toward their tips.

MALE.—Not proven to be of this species though probably so. Collar broader in profile at the top. Clypeus evenly swollen its entire length and therefore depressed along its sides; central third of its lower margin broadly, slightly emarginate; lateral to this the margin runs in a gentle curve upward and outward to below the eye. There is no trace of pubescence anywhere except beside the petiole. First petiole segment not longer than the hind coxa and trochanter together. Second petiole segment varying from ferruginous with a dark or black dorsal stripe to very dark or black with some ferruginous on its sides. First abdominal segment varying from dark, shaded with ferruginous here and there, to ferruginous with black shades, and this may also hold for the second segment.

LENGTH.—Females, 19—23 mm.; males, 19—21 mm. Nineteen specimens studied.

DISTRIBUTION.—Cameron described this species from specimens taken in

Mexico and Temax in Northern Yucatan. I have seen specimens from Guadalajara, Mexico and from Honduras, and others, which I am unable to place elsewhere, from Harris, Humbolt Co., and other (undesignated) localities in California; from Mt. Lemon, Arizona; and Magdalena Mts., New Mexico. Two males from Washburn, N. D., also are apparently the same, but the locality is so far from the places where the others were taken that I reject them from this species until other specimens from intervening localities have been found. Most of the material I have seen was marked "Mex." without fuller data.

Specimens taken at Guadalajara were dated July 6; from Jalisco, Aug. 11; one from Cantarranas, Rio Choluteca, Honduras, Aug. 4 and one from Priesta, Honduras, April 5. Two from Magdalena Mts., New Mexico were taken in July and one from Arizona, July 29.

TYPE.—The British Museum material includes a male from "N. Yucatan Gaumer" marked also "Ammophila Consors Cam Type" in Cameron's writing: two males from "Tierra Colorada, Guerrero. 2000 ft. Oct. H. H. Smith;" "Godman-Salvin Coll." and a fourth male marked "Mex.;" "Smith coll. pres. by Mrs. Farran-White, 99-303." Evidently F. Smith, years before, had a specimen of this species. As Cameron refers to more than one male he probably studied at least one other besides the first named specimen above.

No female was present in the Museum collection, but at the time of my visit in 1913 Cameron had recently died and the collection at his home had just been brought to the Museum and was still in its original boxes. In one of these I found a female labelled "N. Yucatan Gaumer;" "Ammophila Consors Cam.," this second label written by Cameron. I think this must be the specimen from which he prepared his description of the female, and as this sex is described first in his paper, should have been the one to be marked "Type."

This quite variable species needs further study with a long series of specimens. In some ways it greatly resembles Cameron's *nigrocaerulea* and with sufficient material for study they may prove to be the same.

22. **Sphex trichiosomus** (Cameron). (Fig. 29).

**Ammophila trichiosoma* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 11, Plate I, fig. 13, male.

Ammophila trichiosoma Melander, 1903, Psyche, vol. 10, p. 162.

A large species, in many ways resembling *nigricans*. Head, body, legs and most of the abdomen black. Wings quite fuliginous. Pubescence white, scanty; on the clypeus, frons (?), prothoracic lobe and beside the petiole articulation, often reduced almost to sericeous. Traces of sericeous are present on the sides of the body. Pilosity long and quite abundant; black on the head and sometimes on the prothorax, but generally white on the entire thorax.

FEMALE.—*Head:* Broad, but hardly quadrangular from above, the cheeks not being full behind. Clypeus slightly, broadly swollen, its surface with numerous, medium sized punctures and long, erect hairs and a trace of white sericeous, often only at its sides; its lower margin with two small teeth dividing it into about thirds; lateral to the teeth the margin runs slightly upward, then outward; then upward again and outward to below the eye; the reflexed part very narrow. Frons little depressed medially above the antennal fossa, but with an evident indented line to the ocelli and entirely enclosing them; surface with medium punctures and long hairs; blackish or brownish sericeous, largely concealing the surface in fresh specimens, true also of the pro- and mesonotum and sides of the body. Vertex quite high behind the ocelli, evenly rounded from side to side. Cheeks brownish sericeous, nowhere whitish; but little punctured; erect hairs few, below and behind.

Thorax: Collar broader in profile below than at the top, rising rather sharply from the neck, rather flattened from side to side on the top and its sides nearly vertical down to the gutter; its surface blackish-brown sericeous and bearing long, erect hairs, usually some dark, some white; lateral indented line evident to the top of the gutter which is smooth and has a rather weakly developed, broad, front limiting ridge; prothoracic lobe white pubescent on its posterior half. Mesonotum dark sericeous, with scattered, erect, rather short, white hairs. Scutellum quite smooth and shining in front, finely, longitudinally ridged behind. Postscutellum shining, with a few fine punctures. Propodeal disk dull black, even at its sides behind the spiracle; with transverse, quite regular ridges in front to opposite the spiracles, then bending slightly backward and a short distance from the middle becoming very fine; a median band on the disk bears fine, erect, white hairs; end with a pubescent spot on each side of the petiole, extend-

ing upward about to the top of the petiole and outward to the base of the metacoxal knob; sides with rather fine, close ridges running downward behind but turning a little forward toward the front of the plate; its surface with abundant, long, white hairs. Metapluron somewhat finely, weakly ridged; with scattered long, white hairs and with a trace of white sericeous from the hind coxal knob forward, somewhat widely spread out. Mesopluron with a similar trace of white sericeous from the mesocoxal knob forward onto the rectangle, but faint and diffuse; its surface with scattered punctures and long, white hairs; episternal suture running straight downward to about opposite the lower side of the prothoracic lobe where it makes a small forward arch before continuing downward to the underside of the body; an indented horizontal dash, deepest behind, opposite the middle of the prothoracic lobe, not connected with the episternal suture, marks off the front part of the lower end of the rectangle from the rest of the plate.

Petiole: First segment black, shining; the second more or less ferruginous, shaded with black, particularly above and in front.

Abdomen: First segment and part of the second dark ferruginous (the distribution probably varies); rest of the abdomen black; second petiole segment and all the abdomen finely sericeous.

Wings: Quite uniformly fuliginous, sometimes with a faint yellowish tinge; third cubital cell very narrow in front, wide behind, approaching a triangular form; second transverse cubital vein straight. Tegulae dark, slightly lighter behind; shining.

Legs: Black, whitish sericeous; coxae somewhat hairy; spines dark; claws without teeth; with rather light tips.

MALE.—Clypeal margin broadly, slightly emarginate medially, lateral to which it runs quite evenly outward and upward to below the eye; its surface rather flat above the emargination. Metapluron hardly ridged but the punctures tend in part to form rows. Head and body more thickly covered by long, black, erect hairs. Second petiole segment ferruginous with a black, dorsal band. First abdominal segment ferruginous with a black, dorsal spot or streak behind, or entirely ferruginous; a part of the sides of the second segment may also be ferruginous. Smaller wing veins sometimes light brown, almost dark yellow; otherwise the male resembles the female.

LENGTH.—Female (only one seen), 24 mm.; males, 19-29 mm. Nineteen males and one female studied.

DISTRIBUTION.—Cameron studied this species from Capetillo, Guatemala. I have seen examples from New Mexico and Arizona only. These were taken between June 29 and September 24; most of them in July. The single female was taken June 1-15.

TYPES.—Cameron described the species from a single male, now in the British Museum. The sole female Allotype (as I

believe it to be), here described, was captured at Jemez Springs, New Mexico, June 1-15, 1913, by John Woodgate and is in the Cornell University collection. While absolute proof that it is the female of this species is lacking, it is very similar to the males and was taken where five of the latter were also captured.

One male seen has in one wing only a front stub of the second transverse cubital vein.

23. **Sphex cora** (Cameron).

**Ammophila cora* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 14, male.

Ammophila cora Melander, 1903, Psyche, vol. 10, p. 162.

Quite small and slender. Black everywhere except parts of the second petiole and first abdominal segments and (always?) a small, weak spot at the base of the hind femur which is rather dull ferrguinous. Wings quite fuliginous. Pubescence white, sometimes tending toward golden. Pilosity quite abundant, varying from dark on the head and prothorax to white everywhere. Little or no brownish or blackish sericeous present.

MALE.—*Head:* Not quadrangular, the cheeks not being full enough either laterally or backward; front little depressed. Clypeus with about one-fourth of its length below the eyes; very little swollen, slightly depressed in the middle just above the lower margin, about the central third of which is somewhat emarginate, its portion lateral to the emargination running up and out to below the eye in a gentle, even curve; its surface faintly shagreened and with sparse, fine punctures; covered by white sericeous—hardly pubescence—and with dark (and sometimes white) hairs. Frons white sericeous on its sides up about half way from the antennal fossa to the level of the ocelli; median indented line evident up to and around the ocelli; surface shining, with a few fine punctures, fewest along the indented line and near the ocelli. Ocelli practically on the vertex, which is shining and finely punctured. Cheeks very slightly sericeous; with numerous fine punctures chiefly below and near the occiput, and with long hairs there. Mandibles black, reddish piceous toward their tips.

Thorax: Collar rising rather sharply from the neck, quite evenly rounded to, over the top and down behind in an almost uniform curve as seen in profile; shining, with scattered, minute punctures and sometimes with very fine transverse ridges well down toward the neck in front;

evenly rounded from side to side; lateral indented line well marked from the front of the collar to the top of the gutter, which is smooth and with a slight ridge in front, limiting it; prothoracic lobe fairly pubescent. Mesonotum nearly smooth, broken only by fine punctures, not very close in front; and from the middle, backward, by fine, oblique ridges; surface bearing dark to light hairs. Scutellum somewhat finely, longitudinally ridged. Postscutellum sometimes with traces of ridges running outward, but generally only confused. Propodeal disk shagreened, coarsely ridged, the ridges in front running strongly backward and somewhat outward; those farther back running more obliquely outward and the hindermost transverse, leaving a somewhat confused triangle on the median line well toward the back of the disk; entire surface of the disk dull; end with a pubescent spot on each side beside the petiole extending up to about the top of the petiole, and out to the metacoxal knob; sides with rather discontinuous vertical ridges behind, but turning and running nearly horizontally forward on its front part, still somewhat broken; surface with numerous fine punctures and long, slender, white hairs. Metapluron with a pubescent band along the propodeal-metaplural suture from the top of the metacoxal knob to about under the propodeal spiracle; surface with numerous, small punctures, fewer toward the underside; triangle very finely ridged (or aciculate?) downward and forward. Mesopluron with a pubescent band along the meso-metaplural suture from the mesocoxal knob to just under the rectangle, wider and heavier than the metaplural band; rest of the plate rather sparsely punctured with medium sized punctures; rectangle punctured more finely and sparsely; episternal suture nearly straight, ending at the pubescent band about opposite the middle of the prothoracic lobe; surface of the mesopluron bearing long, white hairs.

Petiole: Considerably longer than the hind coxa, trochanter and femur together; its first segment black, the second ferruginous except for a black, dorsal band and sometimes a dark shade near its outer end below.

Abdomen: First segment ferruginous above and on its sides except for a dark, median dorsal streak or cloud varying in size and form; beneath, black; the front margin of the second segment may be ferruginous but the rest of the abdomen is black; its surface possibly slightly pruinose.

Wings: Strongly fuliginous; veins dark brown; second cubital cell quite narrow; second transverse cubital vein straight; outer, back corner of the third cubital cell practically a right angle.

Legs: Black, tending somewhat toward piceous outwardly; more or less white sericeous; spines black, some with light tips; claws black, lighter toward their tips; at the base of the hind femur on its inner side is (always?) a lighter spot tending toward ferruginous.

FEMALE.—Unknown.

LENGTH.—Males, 16-18 mm. Only seven specimens seen; five of them in the British Museum.

DISTRIBUTION.—Cameron's type was taken at San Geronimo in Guatemala: the other specimens I have seen in this country were taken at Guadalajara, Jalisco, Mexico, Sept. 14.

TYPE.—The type is in the British Museum, so labelled in Cameron's writing.

In some regards—dull propodeal disk and the forward running ridges on the sides of the propodeum—this insect suggests some relationship to *guerinii* and *volcanicus,* but its episternal suture is short while in the others it is long. The test by the presence or absence of teeth on the claws cannot be used as the specimens of *cora* are males.

Cameron compares *cora* with his *azteca* by five differencs. A study of the types themselves shows that the first three are correctly given; the fourth needs to be qualified before acceptance, while the fifth—mesonotum not furrowed in the middle—is erroneous, there being such a furrow, though not a strong one, in the type of *cora.*

24. **Sphex centralis** (Cameron).

**Ammophila centralis* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 8, Plate I, fig. 10, male.
Ammophila centralis Melander, 1903, Psyche, vol. 10, p. 161.

Black except that sometimes the second petiole and first abdominal segments may be partly ferruginous, all gradations between these extremes occurring. Pilosity black (the thoracic hairs are sometimes white); white sericeous hairs are abundant and in some cases are almost golden and may become denser on the prothoracic lobe, beside the petiole and along the mesometaplural suture on the mesopluron to form a thin pubescence. In general the sides of the thorax are quite sericeous, but in worn specimens this may be so nearly lost as to give quite a different appearance to the insect. Wings somewhat, but not strongly fuliginous. Legs black. A little below the average size.

MALE.—*Head:* Rather oblong-oval from above, the cheeks retreating in about the same curve as that of the eyes. Clypeus slightly, rather evenly rounded from side to side, with a shallow, broad depression above the middle third of the lower margin which is widely, weakly emarginate; lateral to this the margin curves gently outward and upward to below the eyes; clypeal surface rather densely white sericeous but hardly pubescent; bearing many long hairs. Frons surface similar to that of the clypeus, the sericeous mainly at its sides and stopping about half way up from the antennal fossa to the ocelli; median indented line present but not deep, running to the ocelli, then forking and with a cross line behind; the frons only slightly depressed medially. Vertex evenly rounded from side to side, somewhat higher than the ocelli. Cheeks only slightly white sericeous at most; sometimes not at all; hairs larger and longer below.

Thorax: Collar rising rather sharply from the neck, quite evenly rounded over the top and down behind, its profile seeming to cover nearly a quadrant of a circle; evenly rounded from side to side and generally somewhat whitish sericeous; lateral indented line not very strong; gutter smooth except a few scratches low down; prothoracic lobe more or less pubescent. Mesonotum somewhat white sericeous and, like the collar, with long, erect hairs; quite closely punctured. Scutellum punctured in front, slightly longitudinally ridged behind. Postscutellum confusedly punctured. Propodeal disk confused near its middle, the rather fine ridges being very oblique in front, more transverse behind; the median band with traces of white sericeous; end with a white pubescent spot on each side from beside the petiole onto the metacoxal knob, and upward toward the disk but becoming only sericeous hairs; sides finely ridged and punctured, the ridges running down and slightly forward, some crossing onto the metapluron; punctured between the ridges and a little sericeous. Metapluron with a few faint ridges above, sometimes with short dashes also, but chiefly punctured; quite sericeous. Mesopluron more closely punctured, quite sericeous, particularly along the meso-metaplural suture and often heavier on the rectangle; episternal suture generally short, but sometimes showing faintly, well down at the sides, and in some cases evident all the way down to the underside of the body.

Petiole: First segment black, shining, longer than the hind coxa and trochanter together; second segment varying from black or piceous to piceous above and ferruginous on its sides.

Abdomen: First segment varying from piceous, or piceous above and ferruginous on its sides, to nearly all ferruginous; rest of the abdomen black, sometimes with a bluish reflection; second petiole segment and abdomen more or less pruinose.

Wings: Fuliginous but not deeply so, sometimes with a slightly lighter streak along the ends of the outer cells; veins dark brown; third cubital

cell with a somewhat angular outer back corner and often a trace of the cubital vein beyond; second transverse cubital vein straight. Tegulae black, shining.

Legs: Black; sericeous, the coxae almost pubescent; spines black; claws black, slightly lighter outwardly.

VARIATIONS.—Aside from the variations in color of the second petiole and first abdominal segments the only differences noted are in the amount and density of the sericeous covering.

FEMALE.—Unknown.

LENGTH.—Male, 17-24 mm. Twenty-five specimens studied.

DISTRIBUTION.—The two specimens described by Cameron came from Guatemala. The others I have seen came from Mexico (Jicoltepec, Guadalajara and places not named), Nicaragua, San Domingo, and three from Arizona. Dates of capture are: Guadalajara, August 24 and September 18.

TYPE.—Cameron states that his specimens (number not given) come from "Guatemala, El Reposo 800 feet, San Geronimo (Champion)." In the British Museum are two specimens labelled in agreement with these statements and also marked "B. C. A. Hymen. II. Ammophila centralis Cam" (printed); and "Ammophila centralis Cam. B. C. A. II 6" for one and "Ammophila centralis Cam." for the other, both of these last two labels being in Cameron's writing. Why neither is marked Type I do not know but am satisfied that they are the specimens from which the description was prepared.

Though I cannot distinguish the specimens from Arizona and San Domingo from the Mexican and Guatemalan material, I have named them *centralis* with some hesitation.

25. **Sphex gaumeri** (Cameron). (Figs. 8, 24).

**Ammophila gaumeri* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 4, Plate II, fig. 2, female, male.

**Ammophila micans* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 5, female.

Ammophila gaumeri Melander, 1903, Psyche, vol. 10, p. 161.

Ammophila micans Melander, 1903, Psyche, vol. 10, p. 161.

Medium to large. Black with a bluish to greenish luster produced by the sericeous hairs. Pubescence white. Pilosity black. Collar and mesonotum without ridges. Wings somewhat fuligi-

nous, darker beyond the cells. Body considerably blackish sericeous but with white in some places.

FEMALE.—*Head:* Quite large, rather quadrangular from above. the cheeks being full behind though they do not project laterally; quite oval from in front. Clypeus broad, somewhat swollen centrally but sometimes with a median depression near its lower margin; its surface shagreened, more or less white sericeous; with numerous medium sized punctures, fewest on the lower, central part, and with many long hairs; teeth on the margin dividing this into about thirds, the part between the teeth slightly reflexed; laterally the margin runs upward, then outward to below the eye. Frons quite depressed near the antennal fossa but not strongly so higher up; median indented line fairly deep, running to and around the ocelli; surface black sericeous with a luster, and a little white sericeous at the sides to a point only a little above the fossa, and bearing short, erect hairs. Vertex quite high behind the ocelli, somewhat flatly rounded from side to side, clothed like the frons except it lacks the white sericeous and the erect hairs are longer. Cheeks quite full backward, above, narrowing quickly downward, shagreened, but somewhat shining near the eyes and bearing numerous, long hairs.

Thorax: Neck and collar densely covered by black, sericeous hairs having a luster and with erect hairs longer on the front of the collar than its top. Collar rising from the neck, at first obliquely, then more directly upward, rounding backward to form the top which in profile is not much narrower than the base; top with a slight median depression behind; dropping rather quickly behind; lateral indented line fairly deep, joining the upper end of the gutter which is smooth and has no definite front limiting ridge but a general rising of the plate, in front; prothoracic lobe quite densely pubescent. Mesonotum covered with black sericeous. Scutellum smooth, with more or less of a median depression and traces of longitudinal and oblique ridges close to its hinder margin. Postscutellum closely, finely punctured. Propodeal disk shagreened, dull black in front; median band narrowing backward, with coarse ridges and punctures and bearing short, erect hairs; ridges almost transverse in front, bending backward more, farther back, and becoming fine at the sides, but near the hinder end becoming more nearly transverse again; end with a large, pubescent spot from beside the base of the petiole to, and onto the metacoxal knob and also upward to or a little above the top of the petiole articulation; rest of the end with ridges covering it and running down almost vertically to the propodeo-metaplural suture, with punctures between them, and bearing short, erect hairs; sides sericeous but not concealing the fine but somewhat separated ridges with fine punctures between which run down and a little forward. Metanotum sericeous; with fine punctures and erect hairs, but without ridges except

on the triangle where they are very fine. Mesonotum similar, but the punctures are coarser and farther apart; episternal suture running straight down to opposite the lower side of the prothoracic lobe where it usually becomes somewhat sinuate for a short distance before continuing down to the underside of the body; a somewhat triangular depression in which is an indented horizontal line is present just behind the episternal suture, but not connected with it, which marks a part of the lower limit of the rectangle; there are traces of a white, sericeous band close to the meso-metaplural suture, but only traces.

Petiole: About as long as the hind leg to the end of the femur; its first segment somewhat shining; its second segment minutely sericeous with a bluish luster; lateral margins of its dorsal plate quite piceous.

Abdomen: Black; finely sericeous with a bluish luster.

Wings: Somewhat fuliginous, a little more so beyond the veins which are brown; second cubital cell a little wider behind than usual; second transverse cubital vein generally straight. Tegulae black to piceous; shining.

Legs: Black; coxae densely sericeous with a bluish luster; trochanters less so; tibiae rather shining; tarsi whitish sericeous, particuarly the middle and hind pairs. Spines and claws black, the latter sometimes lighter toward their tips; without teeth.

MALE.—Cameron refers a male to this species but without proof that it belongs here. The insect he describes is not in the Biologia set, so labelled, in the British Museum, but in the Godman-Salvin collection there is a male which meets his description. From his statements and my own notes on this specimen the following items are brought together. Clypeus rather deeply, narrowly emarginate in the middle of its lower margin; its surface covered by a silvery white pubescence tending toward golden which extends upward on the frons. Cheeks strongly white sericeous. There is silvery white pubescence also on the prothoracic lobe and a spot on each side of the petiole base, these last extending upward and almost meeting above the petiole. Scutellum longitudinally ridged. Meso- and metaplura silvery white sericeous. Pilosity on the head and thorax longer. Propodeal sides incompletely ridged, down and somewhat forward; metapluron the same. Mesopluron punctured. Episternal suture continued well down on the body. The bluish luster is mainly on the abdomen and the wings are not as fuliginous as in the female.

LENGTH.—Females, 23-27 mm.

DISTRIBUTION.—Cameron's female type came from Temax in North Yucatan and the male described above was from the same place. I have also seen specimens from Mexico (place not given) and two from San Domingo which I cannot distinguish from this species. These two are

marked "11/68" the only date of capture given for any of them. I have studied fourteen specimens in all.

TYPE.—The female is in the Biologia collection at the British Museum, marked with name, reference to the volume of the Biologia and the word Type, all in Cameron's writing. As already stated, there is no male in the Biologia collection but it seems probable that he studied and described the Godman-Salvin male though it bears no Cameron label. I have not included this male in the key to the species given in this paper. Cameron's type of *micans* described from a single female taken at "S. Geronimo, Guatemala" and marked Type in his writing is in the British Museum. I find no differences of any importance from *gaumeri*.

26. **Sphex fragilis** (F. Smith). (Fig. 6).

**Ammophila fragilis* F. Smith, 1856, Cat. Hym. Brit. Mus., vol. 4, p. 219, female, male.

Ammophila fragilis Taschenberg, 1869, Zeit. f. d. Ges. Naturw., vol. 34, p. 434, female, male.

Ammophila fragilis Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 15, female, male.

?*Ammophila fragilis* Melander, 1903, Psyche, vol. 10, p. 160.

Sphex fragilis Fernald, 1907, Bull. Mus. Comp. Zool., vol. 50, p. 271, female, male.

A small, slender species. Head, body, legs and part of the petiole and abdomen black; remainder ferruginous, the black of the abdomen with a bluish reflection. Pubescence golden. Head hairs sometimes partly black, but generally pale, as on the body. Wings at most only very slightly fuliginous.

FEMALE.—*Head:* Not quadrangular, the cheeks projecting too little laterally; nearly circular in front. Frontal depression evident but not strong. Clypeus slightly swollen above its middle, somewhat broadly depressed below in an indefinite triangle, the lower corners of which are near the teeth; margin of about the usual outline, the teeth about half way from the lateral end to the middle, dividing it into side fourths and a median half; surface with a few coarse punctures below the middle and scattered, finer ones above; golden pubescent, usually partly to wholly worn off. Frons pubescent at its sides up to nearly half way from the

antennal fossa to the front ocellus; median indented line evident; forking, and with a cross line behind the ocelli; surface shagreened and with scattered, fine punctures and a few short hairs. Ocelli forming about an equilateral triangle. Vertex not showing much above the posterior ocelli, evenly rounded from side to side, its surface shagreened; with a few, fine punctures. Cheeks pale golden, almost white, sparsely sericeous behind the eyes from about one third of the height of the eye below its top downward and with numerous, quite long, yellowish white hairs. Antennal scape and pedicel rather piceous below; shining. Mandibles piceous to reddish black.

Thorax: Collar rising obliquely and evenly from the neck, turning backward more quickly above to form a top evenly rounded in profile, its highest point quite close to where it turns down behind; rounded evenly from side to side; sometimes, at least, with a median indentation on top behind; lateral indented line evident around the base of the collar to the top of the gutter, sometimes with a trace of sericeous following it just below; gutter with a few fine ridges, chiefly below; prosternum in front of the fore coxae sometimes pubescent; with long, fine hairs; prothoracic lobe quite densely pubescent. Mesonotum with fairly numerous, medium sized punctures tending toward aciculations and with faint ridges near the front corners and sometimes extending to the middle; surface brownish to golden sericeous. Scutellum strongly, longitudinally ridged. Postscutellum more or less longitudinally ridged and punctured. Propodeal disk having a median band with ridges and punctures and more or less golden sericeous in fresh specimens; the ridges of the disk all oblique and those in front sometimes almost longitudinal; end with a large, golden spot from beside the petiole to the metacoxal knob and upward to above the petiole and possibly crossing there sometimes; sides with rather coarse ridges running downward and the hinder ones curving backward; with punctures between; there is a pubescent spot beside the disk between the spiracle and the postscutellum. Metapluron ridged and punctured about like the propodeal side but more irregularly; with a trace of a pubescent band along the propodeo-metaplural suture which it crosses onto the propodeum toward the spot above (does it ever reach it?). Mesopluron with a heavy pubescent band from the mesocoxal knob forward along the suture up to the subalar area; its surface with numerous coarse punctures and rather coarsely ridged toward the front and below; episternal suture running down in a slight curve to nearly opposite the bottom of the prothoracic lobe, only; an indented branch (?) follows the lower edge of the band backward a short distance where the band turns away from the suture; plura all with a tendency to golden sericeous.

Petiole: First segment black to ferruginous, darker above; second segment ferruginous, sometimes with a black median dorsal band or streak.

Abdomen: First segment varying from all ferruginous to black with ferruginous on its sides and below, only; second and third segments partly to entirely ferruginous; rest of the abdomen black with a bluish reflection.

Wings: Generally uniformly semihyaline or very slightly fuliginous, though sometimes a little deeper beyond the cells than elsewhere; veins brown; second cubital cell rather wider behind than the average. Tegulae brown, lighter behind, shining.

Legs: Black, somewhat whitish sericeous; coxae sericeo-pubescent above; spines black; claws reddish, without teeth.

MALE.—Differs as follows: Clypeus quite elongated, its lower margin broadly emarginate medially, its sides rounding upward and slightly outward, then finally outward below the eyes; central part of the plate above the emargination depressed up about one-third the length of the plate; its surface and also the sides of the frons densely pubescent. Lateral ocelli farther apart than in the female, making the ocellar area less equilateral. Collar rising more directly upward from the neck, making its front and rear faces more nearly parallel. Mesonotum, at least usually, without ridges toward its front. Postscutellum not evidently ridged; confused. Propodeal disk without longitudinal ridges in front and the others tend to turn out more sideways toward their outer ends; sides less ridged. Metapluron at most only faintly ridged. Mesopluron not ridged anywhere; episternal suture without a backward branch (always?) but a depression backward behind the suture may sometimes resemble one. First petiole segment varying from all black to ferruginous with more or less dark or black. First abdominal segment ferruginous except for a median dorsal, black band, often widening behind to form a sort of T; second segment usually black, sometimes slightly ferruginous on the lower front corners of the dorsal plate. Wings generally a little more fuliginous beyond the cells. Short spines on the legs, light; the longer ones dark.

LENGTH.—Females, 17-23 mm.; males, 15-20 mm. Over fifty specimens studied, most of them from South America.

DISTRIBUTION.—Though mainly an inhabitant of South America I have seen specimens from Mexico and British Honduras (exact localities not given) which bring the species within the limits of this paper. Cameron records it from Temax, North Yucatan; northern Sonora, Mexico, and from Cache, Costa Rica. I have no dates of capture.

TYPE.—Smith described the female from Brazil. In the British Museum is a specimen labelled in Smith's writing "fragilis Type Sm." A 15 mm. long male there, bearing a circular label with "Santarem" on one side and "53-92" on the other, is probably the one of which Smith wrote "The male only differs in being a little smaller."

This species has a delicate, fragile appearance which probably led Smith to give it this name. It is evidently quite close to the *arvensis* group as used in this paper.

Sphex arvensis Group

Five species have been described from North America which come in this group, to which might well be added *Sphex fragilis* Sm., but as this is apparently not present in the United States, it is treated separately.

The species here included are most perplexing because they seem to run into one another and only after prolonged study have I been able to distinguish them with any satisfaction. As a result of this work I reduce the five to two species but find two more and a variety to add to the list. Before this position had been reached, however, it became necessary to return to their owners over 2000 specimens of the group which I had been studying and these were all marked *Sphex arvensis*. This name, when found on a specimen labelled by me should be interpreted as meaning that the insect is one of the *arvensis group* unless the label bears the date "'33" or later. I shall be glad to re-examine any of this material and more closely label it for any who may wish to have this done.

Analytical Key to the arvensis Group

1. Episternal suture long 2
   Episternal suture short 3
2. Plura quite sericeous; pilosity long, rather dense..... ..... *pilosus* n. sp. (p. 120).
   Plura not sericeous; pilosity slight..... ..... *arvensis* (Dahlb.) (p. 118).
3. Wings deeply fuliginous; rather large insects in most cases ..... *floridensis* n. sp. (p. 126).
   Wings slightly fuliginous; smaller insects..... 4
4. Body entirely black ..... *urnarius* (Dahlb.) (p. 121).
   Body with ferruginous spots here and there..... ..... *urnarius leopardus* n. var. (p. 125).

27. **Sphex arvensis** (Dahlbom).

**Miscus arvensis* Dahlbom, 1843, Hym. Eur., vol. 1, p. 8.
?*Ammophila arvensis* Lepeletier, 1845, Hist. Nat. Hym., vol. 3, p. 430.
**Ammophila mediata* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 459, female, male.
Sphex arvensis Fernald, Ann. Ent. Soc. Am., vol. 24, p. 446.

There are numerous references to "Sphex arvensis" in literature which, in view of the confusion of the species of this group, cannot be accurately placed and which are therefore omitted here.

Of only average size or less. Head, body, first petiole segment, third (sometimes more or less of the second) and subsequent segments of the abdomen, and the legs, black; rest of the insect piceous to ferruginous. Pubescence white. Pilosity varying from black through dark with light outer parts to the hairs, to wholly white. Wings somewhat fuliginous.

FEMALE.—*Head:* Somewhat quadrangular from above except that the cheeks do not project outward far; nearly oblong-oval from in front. Clypeus quite broadly swollen, but a little depressed obliquely along the eyes; its surface with scattered, rather fine punctures and numerous long hairs but with little of sericeous hairs or pubescence, true also of the frons; its lower margin divided nearly into a median half and lateral fourths, most of the margin with a very narrow, smooth rim which is slightly emarginate medially. Frons not strongly depressed at the antennal fossa nor above, though the median indented line is evident up to the front ocellus, weak at the sides and behind the ocelli; surface shagreened, more closely punctured than the clypeus, and bearing long hairs. Ocelli not quite forming an equilateral triangle. Vertex evenly rounded from side to side, but low, the hinder ocelli practically on the top of the head; its surface shagreened and sparsely, finely punctured. Cheeks similarly shagreened and punctured; with a trace of white sericeous low down behind the eyes, and with many long hairs.

Thorax: Collar broad at its base in profile, rising sharply from the neck a very short distance, then rounded almost like the arc of a circle to its highest point just before it bends quickly downward to form its hinder face; evenly rounded from side to side; its surface shagreened; with numerous fine punctures and often minute transverse ridges on its sides both above and below the lateral indented line; this line evident into the gutter near its top; gutter very slight, with almost no anterior limiting ridge, its surface and that in front bearing ridges and punctures;

prothoracic lobe almost without pubescence but with punctures and hairs. Mesonotum more closely and coarsely punctured, the punctures often showing a tendency to form rows, and in some cases there are slight ridges; with numerous hairs shorter than on the pronotum. Scutellum rather coarsely, partly longitudinally ridged. Postscutellum closely punctured. Propodeal disk with a median, longitudinal, roughened band, lateral to which are rather fine oblique ridges; end with a pubescent spot, often small, on each side of the petiole; its surface transversely, rather coarsely ridged, the ridges running downward when viewed from the side, to the hinder end of the metapluron; sides mainly coarsely punctured, the punctures tending to form rows running downward and the few ridges present having the same direction. Metapluron similarly sculptured, sometimes with a trace of a pubescent band along more or less of the posterior half of the propodeo-metaplural suture and in some cases slightly on the side of the propodeum also; triangle punctured and ridged somewhat coarsely. Mesopluron with a pubescent band from the mesocoxal knob along the suture to, and sometimes slightly along the back margin of the rectangle; surface coarsely punctured and generally with a few vertical ridges, mainly in front; episternal suture extending down to the underside of the body.

Petiole: First segment black; second black to piceous in front, shading irregularly into brown or dull ferruginous behind.

Abdomen: First segment and sometimes a part of the second, ferruginous; rest of the abdomen black, rarely with a bluish reflection.

Wings: Varying from slightly to quite fuliginous though not deeply so; second cubital cell quite wide both in front and behind. Tegulae black with a resinous tinge behind.

Legs: Black, often slightly piceous or brownish outwardly; faintly whitish sericeous in some lights; hairs and spines black; bases of the claws black or dark, ferruginous toward their tips.

MALE.—Clypeus and frons white pubescent, the latter on its sides and about half way up to the front ocellus; prothoracic lobe partly pubescent; plural pilosity at least generally white; first abdominal segment usually with a black dorsal streak; mesonotum rarely with ridges: otherwise much like the female.

LENGTH.—Females, 16-24 mm.; males, 14-20 mm. Over 500 specimens studied.

DISTRIBUTION.—Generally present over the northeastern United States and Canada. I have not seen specimens from south of the Carolinas where it seems to be replaced by *urnarius*.

This species is very difficult to separate from *pilosus*. The latter is more densely hairy, however, and the head hairs are white. As *arvensis*

sometimes has its head hairs dark at base but white or nearly so toward their tips, this difference fails as a certain distinction. In *pilosus* the plura are somewhat sericeous while this is seldom or never the case with *arvensis*. Most of the specimens of pilosus I have seen were taken west of the Mississippi River while the greater part of the *arvensis* material comes from the East and North. Still, *mediatus*, which I cannot separate from *arvensis*, was described from "Colorado Territory" and I have seen many specimens from that region and all appear darker and stouter than the typical *arvensis*.

TYPES.—The type of Dahlbom's *Miscus arvensis* is in his collection at Lund. It has the petiolated third cubital cell of his description and agrees with it in every way. He refers to an "Ammophila id. Klug. Mus. Berolin." and I found there a specimen labelled "N. Amerika" on green paper; "arvensis N Am. Sept." in Klug's writing, which is the same species. It would seem that Dahlbom considered that the petiolated cell removed his specimen from the same genus as the Berlin one and that he would take the same specific name for it as Klug had chosen for his *Ammophila,* perhaps to suggest the practical identity of the two except in the venation.

Cresson described *mediatus* from six female and three male specimens from "Colorado Territory." The type, a female, as later selected by him, is in the collection of the American Entomological Society (Type No. 1924-1). I cannot separate it structurally from *arvensis,* though its rather stouter build, its dark hairs, and its general appearance make it look slightly different from typical *arvensis*. It should be remembered that at the time of Cresson's work *arvensis* had been described as a species of *Miscus* because of its petiolated cell and at that time this character was believed to be a fixed one. Cresson, therefore, had no occasion to consider the possibility that his *mediatus* could be *arvensis*.

28. Sphex pilosus n. sp.

Below the average size and rather slender, though the female may be nearly as stout at *arvensis*. Pilosity white, quite dense and long, particularly in the males. Plura rather sericeous. Mesonotum nearly always, at least, with traces of ridges. Second petiole segment generally, and the

second abdominal segment at least sometimes ferruginous. In the male the lower margin of the clypeus is less strongly emarginate than in *arvensis* and its median portion seems narrower before it turns obliquely upward. Otherwise this species closely resembles *arvensis*.

TYPES.—Described from a Holotype female, Cresson's Paratype No. 1926-3, and an Allotype male, Cresson's Paratype No. 1926-24, of *Sphex vulgaris,* these not being the same species as Cresson's Type (Holotype) of *vulgaris*: also from a male and a female Paratypes, both from Nevada, in my collection.

Ammophila vulgaris was described by Cresson from 20 female and 18 male specimens from "Colorado Territory." Later he selected one of the females from the lot as type ("Type No. 1926-1"), and a part of the remaining specimens were marked and numbered as paratypes. These are in the American Entomological Society collection. When I examined the lot I found besides the Type 12 females and 11 males marked as paratypes. Of these, the Type, No. 1926-1 and one female paratype, No. 1926-4, have a short episternal suture and are really *Sphex urnarius* while the remaining paratypes are either *arvensis* or an undescribed species. As indicated above I have decided to consider them as a new species and have chosen two of the Cresson paratypes as types. However, *pilosus* may prove to be only a variety of *arvensis*.

29a. **Sphex urnarius** (Dahlbom). (Fig. 34).

**Ammophila urnaria* Dahlbom, 1843, Hym. Eur., vol. 1, p. 14.
Ammophila urnaria Dahlbom, 1845, Hym. Eur., vol. 1, p. 450.
**Ammophila vulgaris* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 458, female (pars). (nom. preocc.).
**Ammophila inepta* Cresson, 1872, Trans. Am. Ent. Soc., vol. 4, p. 209, female, male.
?*Ammophila fragilis* Melander, 1903, Psyche, vol. 10, p. 160.
Ammophila vulgaris Fernald, 1931, Ann. Ent. Soc. Am., vol. 24, p. 447.
Ammophila urnaria Fernald, 1932, Ent. News, vol. 43, p. 124. Habits.

Numerous other references under the names *urnaria* and *arvensis* occur, but with nothing to show whether they belong to the one or the other species: they are therefore omitted here.

Rather small, frequently quite small insects having a black head, body, petiole (the second segment may be piceous), most of the abdomen, and legs which may be lighter outwardly. Pubescence white. Pilosity varying from black on the head and prothorax and white elsewhere, through brownish at the base and whitish outwardly on the head, to white everywhere. Very little sericeous anywhere. Wings only slightly fuliginous.

FEMALE.—*Head:* Broad but hardly quadrangular the cheeks not being full enough laterally; from in front quite oblong-oval. Clypeus generally with a rather noticeable rim between the teeth, showing a slight median notch or emargination; its surface swollen centrally but not at its sides; hardly pubescent or even sericeous, but with rather coarse punctures and long hairs. Frons only slightly depressed medially, the median indented line evident to and enclosing the ocelli; surface shagreened, more finely punctured than the clypeus. Ocelli nearly forming an equilateral triangle, the hinder pair almost on the vertex. Vertex shagreened and more sparsely punctured than the frons. Cheeks faintly white sericeous low down, close behind the eyes and with numerous long hairs below. Mandibles sometimes slightly piceous.

Thorax: Collar broad in profile, rising quite slopingly and without much curve to its top which is evenly rounded, its highest point a little in front of where it turns down rather quickly to form its hinder face; evenly rounded from side to side and sometimes with a slight median depression toward the back of the top; lateral indented line evident, entering the gutter and nearly crossing it below its top; gutter quite wide, with a fairly well developed limiting ridge in front; its surface nearly smooth, with a few scratches, only; collar surface as a whole with fine punctures. Mesonotum quite closely punctured and with a few ridges, chiefly behind. Scutellum punctured and more or less longitudinally ridged. Postscutellum confused. Propodeal disk closely punctured except at its sides where there are fine ridges running obliquely backward; end with more or less of a pubescent spot beside the petiole; the rest of this partly closely punctured and with ridges across the middle; sides also closely punctured and with some nearly vertical ridges, chiefly behind. Metanotum rather coarsely punctured, usually with few ridges; generally with traces of a narrow, incomplete, pubescent band running along the propodeo-metaplural suture from the metacoxal knob to about below the spiracle, which varies greatly in its degree of development and may be in part a little on the propodeal side. Mesopluron with a well developed pubescent band from the mesocoxal knob to the bottom of the rectangle; rest of the plate rather coarsely punctured; episternal suture extending

down to about opposite the lower side of the prothoracic lobe; an indentation behind this suture marks a part of the lower end of the rectangle.

Petiole: First segment black, shining; second segment black or piceous with small amounts of ferruginous, mainly posteriorly.

Abdomen: First segment ferruginous, often tinged with black behind; rest of the abdomen black, often with a bluish reflection; minutely sericeous or pruinose.

Wings: Slightly fuliginous; veins brown; second cubital cell rather wider than the average, behind. Tegulae piceous, lighter behind.

Legs: Black, often piceous outwardly; sometimes quite whitish sericeous; hairs light; spines sometimes darker, but often lighter than the segments they are on; claws dark at the base, ferruginous outwardly.

MALE.—More pubescent than the female. Clypeus swollen but somewhat depressed laterally and also medially below; its lower margin with a strong and not very wide median emargination below the clypeal depression; the emargination ends at each side in a projecting point, lateral to which it runs outward and upward in a rather even curve and finally turns outward below the eye; clypeal surface shagreened; sparsely, finely punctured; pubescent and with long hairs. Frons similarly pubescent at its sides about half way up to opposite the front ocellus; its surface shagreened, more closely and coarsely punctured than the clypeus. Hinder ocelli much farther apart than from the front one; median indented line evident up to and all around the ocelli. Vertex somewhat flattened above, the hinder ocelli almost on the vertex. Cheeks whitish sericeous close behind the eyes, well up.

Thorax: Collar rounded in profile, much more nearly a part of a circle in outline than in the female; rather sparsely and finely punctured. Mesonotum more closely punctured than in the female and with traces of ridges here and there. Scutellum longitudinally ridged but with punctures between, making the ridges somewhat irregular. Postscutellum roughened, confused. Propodeal disk with a punctured median band from which emerge oblique ridges which bend slightly forward near their outer ends; end with a pubescent spot on each side of the petiole, the rest closely punctured and possibly slightly ridged; sides more coarsely, closely punctured, sometimes with short, incomplete ridges. Metanotum somewhat coarsely but less closely punctured than the propodeal side, occasionally with short, dash-like ridges; surface liable to be somewhat sericeous and often with a trace of a pubescent band from the metacoxal knob along the propodeo-metaplural suture which it sometimes crosses a little onto the propodeal side and extending to about below the spiracle. Mesopluron coarsely, less closely punctured, with a pubescent band from the mesocoxal knob along the suture to the base of, and sometimes a

little onto the rectangle; surface quite sericeous, particularly behind; rectangle sparsely, finely punctured.

Petiole: Second segment varying from black to dull ferruginous; in the latter case often with a black dorsal band.

Abdomen: First segment ferruginous, but generally with more or less of a black dorsal band which often widens out behind along the hinder margin of the plate; its ventral plate sometimes with black spots or shades; remainder of the abdomen black, often with a bluish reflection.

Wings: These may be almost hyaline but are usually at least somewhat fuliginous; veins brown. Tegulae as in the female.

Legs: Varying from black to piceous or a brownish black; spines generally darker but sometimes lighter than the segments they are on; claws as in the female.

LENGTH.—Females, 17-23 mm.; males, 14-20 mm. Over 1000 specimens studied.

DISTRIBUTION.—This species though found far north seems to be most abundant in the Middle Atlantic States. I have seen specimens from as far south as northern Georgia, but south of Virginia the insect appears to become smaller, more delicate and fragile in appearance and in this condition was named *inepta* by Cresson. Westward it appears to be present beyond the Mississippi River, but how far, and over what territory it occurs I cannot say, having found it necessary to return the material loaned me before I had successfully distinguished the species of the *arvensis* group. It is my impression that though distribution of the two species overlaps, *arvensis* is more predominantly northern and *urnarius* more southern.

TYPES.—Dahlbom apparently described *urnarius* from at least two specimens for he writes: "Habitat SudCarolinae & Pennsylvaniae arenosis." In the Dahlbom collection at Lund I found a male marked "S. Carolina Zimrmn:" "Am. gracilis Pelet. Am. urnaria nob olim (♂ ♀". A second specimen is labelled "urnaria Kl. Mus. Berl." In Berlin I could find no specimen of *urnaria* bearing any evidence of having been labelled or seen by Klug, or which I could consider as having been seen by Dahlbom, so if there was such a specimen there it has been lost. Accordingly, the first named specimen above is probably one of those used by Dahlbom and would rank as a type.

The discovery of two species among the material used by Cresson in describing his *Ammophila vulgaris* has already been

discussed under *pilosus*. The female he selected as the Type (Type No. 1926-1) and one female paratype are the only ones of the lot which have a short episternal suture and they are *urnarius*.

Ammophila inepta was described by Cresson from "five ♂♀ specimens" taken in Texas. A female marked "Type No. 2677" is in the collection of the American Entomological Society, and a male and female marked "Type No. 1683" are in the National Museum collection. I have been unable to locate the other two specimens but suspect they are among other examples of this species at Philadelphia. I can only consider *inepta* as a small form of *urnarius*, such as is common from Virginia to Georgia and southwestward.

29b. Sphex urnarius leopardus n. var.

Six specimens of what I consider a color variety of *urnarius* have come to my attention. They are all of the small, fragile form (*inepta* form) but differ from it in having dull ferruginous spots or areas on different parts of the body. These areas vary more or less in the different specimens, four of which are females and two males.

These dull ferruginous areas are as follows:

Prothoracic lobe; all the specimens.
Area in front of the prothoracic lobe, varying in size and depth of color: four females; one male.
Upper front corner of the mesopluron: four females; in one it runs down in front of the episternal suture.
Showing through the mesoplural pubescent band and a little in front of it, but not on the rectangle: three females.
On the plate between the mesocoxae: four females; one male.
On the metacoxal knob and forward, covering most of the metapluron and some of the adjacent propodeal side: three females; one female on the knob only; two males with traces on the knob only.
Showing through the pubescent spot beside the petiole and extending to the metacoxal knob four females; one male.
The legs tend toward dull ferruginous in the females but are more nearly dark reddish brown in the males.

LENGTH.—Females, 16-17 mm.; males, 17 mm.

DISTRIBUTION.—The males and two of the females are marked "Ga." only; one female is marked "Spring Creek, Ga. 18-21 May, '16. J. C. Brad-

ley" and the other "Unadilla, Ga. VI, 25, '10 J. C. Bradley." Evidently the distribution is very local.

TYPES.—A female and male from "Ga." as Holotype and Allotype, respectively, for the variety. These specimens are in the American Entomological Society collection. I have made the other four specimens paratypes: the male (abdomen gone) in my own collection; one female in the American Entomological Society collection, and the other two in the Cornell University collection.

One male and one female in the American Entomological Society collection bore a museum label "variegata B." showing that Blake had studied these insects though he never published them. Unfortunately, I cannot adopt this name as there is already a *Sphex variegata.*

30. **Sphex floridensis** n. sp. (Figs. 31, 32).

Sphex arvensis floridensis Fernald, 1933, Ent. News, vol. 44, p. 236 (nom. nudum). Habits.

Generally rather over average size though smaller examples are frequent. Black except the first abdominal segment and (usually) more or less of the second petiole segment. This may be all black, however, and the first abdominal segment may have a black dorsal band. Pubescence white. Pilosity black on the clypeus in the female, white in the male; black on the frons and vertex in both sexes; black on the prothorax in the female, white in the male; white elsewhere in both sexes. Wings quite fuliginous in nearly all cases.

FEMALE.—*Head:* Not quadrangular from above, the cheeks not being full laterally though quite so backward; a rather flattened oval from in front; frontal depression fairly strong but not extending far laterally; occipital fossa quite marked. Clypeus generally somewhat swollen, with a slight median depressed line; coarsely, not closely punctured; with long, erect hairs and sometimes with a faint trace of whitish sericeous on the lower corners; its lower margin typical in outline. Frons punctured a little more finely, shagreened, and with traces of sericeous; median depressed line quite strong up to the front ocellus and entirely around the ocelli which are nearly in an equilateral triangle. Vertex higher than the poste-

rior ocelli, a little flattened on top but almost evenly rounded from side to side; shagreened and rather sparsely, finely punctured. Cheeks faintly white sericeous behind the eyes on their lower half; shagreened and with long whitish hairs below.

Thorax: Collar rising at an oblique angle from the neck and nearly without any curve till well toward the top, then rounding backward, its highest point about in the middle of the top region, then turning down a little to the mesonotum; at its side the groove between the collar and mesonotum widens downward and forms the top of the gutter, which, therefore, is not rounded at its upper end but V-shaped; below the lateral indented line the front limit of the gutter is well developed as a broad, rounded ridge; collar evenly rounded from side to side, with a faint median line on top; finely punctured, more coarsely so below the lateral line but smooth on the front ridge limiting the gutter; prothoracic lobe pubescent on its hinder half. Mesonotum more coarsely punctured, particularly toward the front and corners where the punctures tend to form rows; there are a few oblique ridges near the back end and sometimes across the median line on the hinder half of the plate; pilosity fine, short. Scutellum strongly longitudinally ridged. Postscutellum closely, irregularly punctured; with traces of oblique ridges at the sides. Propodeal disk with a band nearly the width of the disk in front, narrowing to a point behind, which is closely punctured between the ridges; ridges running only slightly oblique at first, but becoming more so going backward; finer lateral to the median band, shining and slightly irregular; end with a small pubescent spot on each side of the petiole not extending far in any direction; with ridges running out, then down, and somewhat anastomosing which is also true of the side, and with punctures between, and bearing rather short, erect hairs. Metapluron similar but with more definite ridges and more and coarser punctures; a trace of pubescence or sericeous occurs along the propodeo-metaplural suture in front of the metacoxal knob and sometimes crosses slightly onto the propodeal side; triangle punctured, occasionally with traces of very fine ridges. Mesopluron with long, coarse ridges, particularly below, and with coarse punctures; with a definite pubescent band from the base of the mesocoxal knob forward along the suture, often narrowing in front, to, or sometimes onto the lower back corner of the rectangle; rectangle more sparsely and finely punctured than the rest of the mesopluron; episternal suture well developed, extending to a little below the middle of the prothoracic lobe; not connected with an indentation which marks part of the bottom of the rectangle.

Petiole and Abdomen: Petiole black except the hinder part of the second segment; this and all or nearly all of the first abdominal segment deep ferruginous; rest of the abdomen black.

Wings: Quite fuliginous; veins dark brown; second cubital cell of only medium width behind; the third variable in width and form. Tegulae black, rather shining.

Legs: Black, sometimes tending toward piceous outwardly; hairs and spines black or very dark; claws ferruginous outwardly.

MALE.—More slender. Clypeus and frons white pubescent, often with a golden tinge. Clypeus quite flat, rather long, its lower margin with a somewhat deep median emargination which ends at a projecting point on each side beyond which the margin runs upward and outward to below the eye where it turns outward; its surface shagreened and with scattered, medium to rather fine punctures and long, erect, white hairs; there is a slight median depression of the surface above the marginal emargination. Frons pubescence extending about half way from the antennal bases to the top of the eyes and rather wide. Collar, seen in profile, rising more sharply from the neck, evenly rounded all the way up and back to its highest point which is farther forward than in the female; the profile appears to be nearly a quadrant of a circle. Metaplural pubescent band often more developed. Mesoplural band often covering the hinder half of the rectangle. Second petiole segment varying from all black to ferruginous with a black, median dorsal band. First abdominal segment sometimes with a black, median dorsal band also which widens behind. Body more strongly pilose.

LENGTH.—Females, 19-27 mm.; males, 15-25 mm. About 100 specimens studied.

DISTRIBUTION.—All the specimens seen have come from Florida and Georgia except two males and three females taken in North Dakota which I am unable to separate from this species though I cannot think they are really *floridensis*.

Specimens may be taken in Florida at almost any time between February and December. A specimen from Georgia was taken June 7.

TYPES.—Described from a Holotype and two paratype females and an Allotype and three paratype males. The Holotype female, Allotype male and a paratype male are in my own collection. A paratype female and male are in the United States National Museum; another paratype female and male are in the American Entomological Society collection. All of these are specimens taken by me at or near Orlando, Florida.

31. **Sphex junceus** (Cresson).

**Ammophila juncea* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 460, male.

?**Ammophila alticola* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 10, male.

?**Ammophila chiriquensis* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, Plate I, fig. 9a, male (error of name).

Ammophila juncea Melander, 1903, Psyche, vol. 10, pp. 157, 161.

Sphex junceus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 405, female, male.

It has always been a question what the female of this species really is. Cresson's *strenuus* has sometimes been considered to be that sex, but without proof. The presence of a mated pair in the collection of Dr. Jos. Bequaert of the School of Tropical Medicine of Harvard University, in which the male is *junceus* now makes it possible to recognize the female, a description of which is here given for the first time.

Head, body, first segment of the petiole (this may be piceous), last three segments of the abdomen and the legs, black; the abdomen sometimes with a bluish reflection. Wings slightly fuliginous. Pubescence white (in southern specimens tending toward golden). Pilosity sometimes black on the clypeus in the males, but generally white everywhere in both sexes; mostly short and not abundant except on the head. The pubescence covers the clypeus, sides of the frons, prothoracic lobe; is a broad band on the mesopluron along the meso-metaplural suture from the mesocoxal knob onto the subalar area; a weaker one beginning at the metacoxal knob and passing along the propodeo-metaplural suture but soon crossing onto the side of the propodeum and shortly becoming sericeous and disappearing just anterior to the spiracle; a large spot beside the base of the petiole and extending above it; in some cases a spot at the side of the disk between the spiracle and the postscutellum; and a streak on the upper side of each coxa.

FEMALE.—*Head:* Rather broad, slightly hour-glass shaped from above, the cheeks being quite full both laterally and backward and the frontal and occipital depressions fairly strong; quite broadly oval from in front

when the mandibles are closed. Clypeus quite broad, somewhat swollen above the middle but with a median depression below, which gives the swollen part something the form of a broad horseshoe; deepest part of the depression not punctured; elsewhere the surface is shagreened, finely and sparsely punctured; the teeth of the lower margin divide it nearly into a median half and lateral fourths, the part between the teeth with a weak median depression, the sides curving upward, then gently outward to below the eyes. Frons broadly, but not very deeply depressed, its sides pubescent half way up to the median ocellus at the sides; median depressed line evident, forking at the ocelli and with a cross line behind. Ocelli forming nearly an equilateral triangle below the vertex which is evenly rounded from side to side; frons and vertex shagreened, very faintly whitish sericeous and with a few erect hairs. Cheeks sericeous behind the eyes, particularly below, where there are numerous long hairs. Antennal scape strongly sericeous below. Mandibles black, sometimes tinged with resinous.

Thorax: Collar broad at its base in profile, sloping upward rather evenly to a rounded top, evenly rounded from side to side, quite sericeous, particularly above; with scattered, fine punctures and rather short, erect hairs; lateral indented line evident to the upper part of the gutter which is almost entirely smooth; prothoracic lobe heavily pubescent. Mesonotum with fairly numerous, medium sized punctures, shagreened, and covered faintly with light brown (?) sericeous hairs. Scutellum coarsely, longitudinally ridged. Postscutellum confused, but with traces of longitudinal ridges. Propodeal disk with a median band the width of the disk in front but narrowing backward, which is quite sericeous and seemingly closely punctured; lateral to this the disk is finely ridged, the ridges running obliquely backward but turning outward toward their ends; end mostly concealed by the pubescent spot on each side which extends from beside the petiole to the metacoxal knob and nearly up to the end of the disk, but not tending to cross to the other side; propodeal side rather finely, somewhat irregularly ridged, the hinder ridges turning slightly backward below, those more forward turning slightly forward; surface shagreened and with punctures; faintly sericeous and bearing short, erect hairs; the metaplural pubescent band crosses the suture onto the side of the propodeum well back and runs forward and upward somewhat toward a pubescent spot beside the disk between the spiracle and the postscutellum (do they ever connect?). Metapluron with somewhat irregular ridges running downward, not very close together, with punctures between, the ridges becoming lost below and in front; the pubescent band, which is narrow, runs forward from the metacoxal knob a short distance before crossing onto the propodeal side; surface with fine erect hairs, longer below, and traces of sericeous; metaplural triangle finely ridged. Mesopluron shagreened, rather closely punctured, and with vertical ridges, stronger and

closer together in front; a rather broad pubescent band runs from the top of the coxal knob along the meso-metaplural suture to the subalar area; surface faintly sericeous and bearing erect hairs, longer and more numerous below; episternal suture running straight down to nearly opposite the lower part of the prothoracic lobe; an indentation backward sometimes looking like a branch of the suture marks off a part of the lower end of rectangle.

Petiole: Both segments more or less ferruginous beneath, the first darker at its sides and above, the second with a black dorsal band along more or less of its length and which may continue on the first abdominal segment.

Abdomen: First and second abdominal segments ferruginous but the back part of the second is liable to be black or dark; remainder black, often with bluish reflection; surface somewhat faintly sericeous, especially above; hairs near the end of the abdomen rather light colored.

Wings: Slightly fuliginous; veins brown, lighter outwardly; second cubital cell a little wider behind than the average. Tegulae dark brown, lighter behind .

Legs: Black but tending toward chestnut color outwardly; slightly sericeous, the coxae with touches of pubescence above; spines dark but the hairs on the fore legs are white; claws dark basally, dark ferruginous toward their tips.

MALE.—Differs as follows: Clypeus rather long; its lower margin with a somewhat narrow, deep excavation at the ends of which is a point though hardly a tooth, beyond which the margin runs upward and outward, sometimes sinuately, turning out under the eyes; above the excavation the surface is strongly depressed for a short distance upward. Ocelli nearly on the vertex. Cheeks not as full laterally. Collar about as broad at its base as in the female, but rising more directly upward (less sloping) and evenly rounded in profile and also from side to side, highest very nearly at its hinder margin while in the female the highest point is a little in front of this; the profile of the collar appears to cover nearly a quadrant of a circle with the outline nearly that of a circle. Gutter with only a few small punctures. Mesonotum more closely punctured, somewhat ridged transversely behind its middle. Metapluron less evidently ridged, if at all so, but the punctures tend to form rows; its triangle closely punctured, apparently without ridges. First segment of the petiole black.

VARIATIONS.—This species varies in the amountof pubescence from rather little to very heavy. Most of the heavily pubescent forms are from more northern localities while those less pubescent are mainly from Colorado and that latitude and farther south, though there are many exceptions to this. Though the scutellar ridges are generally longitudinal, in some they tend to diverge, and in some cases there seems to be a median center a little behind the front margin around which the more lateral ridges seem to loop

like broad inverted U's. The first segment of the petiole in the female, at least, may vary between black and ferruginous, but many of those apparently black have a ferruginous or resinous color when held against a strong light. In most cases the mesonotum is not ridged. Sometimes the punctures are more or less in rows and in a few cases I have seen actual ridges. The black dorsal band on the second petiole and first abdominal segments may be continuous on these and the second abdominal segment as well and widen out on this last to form a mark something like a T, and this is sometimes found on both segments. The Scutellum may sometimes be smooth with faint ridges behind; weakly ,or strongly ridged. The width of the clypeal excavation in the male varies considerably and its ends vary from two sharp points close together to two blunt ones a little distance apart. In some cases the pilosity on the head, prothorax and mesonotum may be black.

LENGTH.—Females, 18-22 mm.; males, 17-22 mm. Many specimens studied.

DISTRIBUTION.—I have seen specimens of this species from Michigan (Aug. 23); South Dakota; North Dakota (Aug. 20); Minnesota (Aug. 28); Montana; Wyoming (Aug. 29); Washington (Sept. 30); Oregon (Aug. 20; Oct. 22); California; Lower California; Western Kansas; Colorado; Utah; Texas (June 1 and 24); New Mexico (June 28, Aug. 17, Sept. 9); Arizona (Apr. 20?, July 15, Sept. 3) and Mexico. It has been taken on the flowers of *Verberia, Solidago arizonica and Cleome serrulata.* It has been captured dragging a paralyzed lepidopterous larva: "cutworm,' 'in one case.

TYPES.—Cresson's type, a male from "Colorado Territory," is in the American Entomological Society collection. The species was described from a single specimen (Type No. 1927). Cameron apparently described *alticolus* from a single male also. There seems to have been some confusion in the Biologia Hymenoptera, Volume II, page 10, in this connection. Though Cameron described *alticolus* from a male and *chiriquensis* from a female, his Plate I, fig. 9a, representing male genitalia, is there marked as of *chiriquensis!* He seems to have noticed this and corrected the error, for at the beginning of his description of *alticolus,* immediately following the name he puts in parenthesis "(A. chiriquensis, Tab. 1, fig 9a, ♂)" and under *chiriquensis* on page 18 he claims as illustration for that species only "Tab. I, fig. 9, ♀) and says in a footnote that the genital organs figured on

Tab. I, fig. 9a do not belong to the male of this species (*chiriquensis*) but to that of *alticola*.

When I studied these insects at the British Museum in 1913 I found there a single female specimen labelled: "V. de Chiriqui 4000-6000 ft. Champion;" "Type" on a circular label; "B. C. A. Hymen II. Ammophila chiriquensis Cam."; "Ammophila chiriquensis Cam. p. 18 V. Chiriqui," and "Ammophila alticolus Cam. Type ?? G. E. C." The first three of these are printed; the fourth is in Champion's writing and the fifth is in Cameron's writing except for the "??" and the initials, which Champion evidently added when he found a type label for a male described, on an undescribed female. Just as I was studying this confusion Cameron's own collection arrived at the Museum and on going over that I found there a male marked "V. de Chiriqui, 2-3000 ft Champion"; "Sp. 24 a"; "Ammophila Chiriquensis Cam. Type."

From these facts I am of the opinion that Cameron's two type labels in some way got onto the wrong specimens, particularly as the female bearing Cameron's *alticolus* type label agrees with his description of *chiriquensis* and the male bearing his *chiriquensis* type label agrees well with his description of *alticolus*. Whether any rearrangement of these labels has been made since 1913 I do not know, but in my opinion these labels written by Cameron should be exchanged.

I suspect that *alticolus* and *junceus* may prove to be the same species, the differences noted being due to the fact that I have seen no specimens of the latter from south of Mexico, while Cameron's specimens came from Panama. Yet it is not impossible that they may be distinct species. The relation of *chiriquensis* to this problem is discussed under that species.

Female described from an Allotype (the female of the pair in the collection of Dr. Joseph Bequaert, from "Wharton, Wharton Co., Tex. 24-vi-17") and six paratypes. Two of these, one marked "Tex. 5.6.00" and the other "Colo. 2153" respectively, are in the United States National Museum collection: two, one marked "Texas" and the other "Hot Springs, S. D., Deposited

by W. J. Fox" in the American Entomological Society collection: and two, one marked "Las Cruces 9.9.N. M. On fls. Solidago arizonica" and the other with no data, in my own collection.

32. **Sphex chiriquensis** (Cameron). (Fig. 11).

**Ammophila chiriquensis* Cameron, 1888, Biol. Centr.-Am., Hym., vol. 2, p. 18, Plate I, fig. 9, female.

Ammophila chiriquensis Melander, 1903, Psyche, vol. 10, pp. 161, 164, female.

Of about medium size. Head, body, back part of the abdomen and the legs, black. Pubescence nearly or quite golden; on the clypeus, frons, prothoracic lobe, a mesoplural band and a trace of a metapluro-propodeal one, beside the base of the petiole, beside the propodeal disk (always?), and a little on the upper side of the coxae. Pilosity whitish to yellowish except sometimes a few dark hairs on the clypeus. Some brownish sericeous areas occur.

FEMALE.—*Head:* Not quadrangular from above, the cheeks not extending enough laterally, but not compressed enough medially in front and behind to be called hour-glass shaped; from in front rather broadly oval. Clypeus not very much swollen centrally, rather sparsely punctured, pubescent (scanty in worn specimens) and generally with a few long, dark hairs near or on the lower margin, those elsewhere being pale; lower margin with the teeth dividing it variably into a median half and lateral fourths, or into thirds; the part between the teeth and sometimes somewhat beyond them rather extended into a rim, the outline of which varies from a median notch and sinuate outline out to the teeth, to almost a straight edge; lateral to the teeth the margin turns upward sharply a short distance, then outward to below the eyes; the margin between and including the teeth distinctly dark ferruginous; remainder of the clypeus black. Frons not strongly depressed except at the antennal fossa; with an evident median indented line forking at the ocelli and with a cross line behind them; sides pubescent well up toward opposite the ocelli; its surface sparsely, finely punctured and bearing short, erect hairs. Vertex rather high, evenly rounded from side to side, its surface like the upper part of the frons, brownish sericeous and with a few hairs. Cheeks silvery to golden sericeous behind the eyes; with scattered, rather small punctures and long, erect hairs below the middle.

Thorax: Collar quite broad at its base in profile, rising somewhat obliquely from the neck and curving only very slightly till well up when it rounds back in an even curve, behind which it drops sharply by a quick

curve to form the posterior face, the highest point of the top being in front of its hinder part; evenly rounded from side to side and with no median notch or depression on top; lateral indented line evident, running to the upper corner of the gutter which is smooth except for a few fine ridges along its back part; in the type there is a pubescent band along the lateral indented line and another along the pronoto-proplural suture but these are not usually present; surface of the collar with a very few fine punctures and short, pale hairs; mostly covered by a dark, sericeous coat sometimes having a golden tinge. Mesonotum covered by a similar but more definitely golden coat of sericeous hairs; rather coarsely punctured and sometimes with weak, oblique ridges inside and behind the tegulae and with a trace of a sericeous band there. Scutellum coarsely, longitudinally ridged though sometimes the ridges diverge backward a little. Postscutellum slightly, more finely ridged; both plates minutely punctured also and bearing fine hairs. Propodeal disk with a median, silvery white to golden sericeous band more or less concealing the markings beneath in front of the spiracles; from here back they run obliquely out and backward, bending forward toward their outer ends but not becoming transverse; at the hinder part a few ridges are practically transverse; end with a pubescent spot between the side of the petiole and the side of the metacoxal knob and extending upward nearly to the disk; sides somewhat irregularly, closely but not coarsely ridged, the ridges running about vertically behind, a little more forward toward the front; with punctures between and and short, erect hairs. Metapluron similarly ridged but the ridges are sometimes lacking; with rather coarse punctures; the pubescent band which runs forward from the metacoxal knob crosses onto the propodeal side about under the spiracle and runs upward to join a pubescent spot beside the disk between the spiracle and the postscutellum though in many cases the band is reduced to sericeous, absent in part or even absent entirely except for a faint trace at some place or places; the triangle may be very finely ridged and punctured or only punctured. Mesopluron with a broad pubescent band from the mesocoxal knob along the suture and over the rectangle to the subalar area; the rest of the plate with coarse punctures showing a tendency to form rows, and also with suggestions of ridges in some cases, particularly near the fore coxae; episternal suture running straight down to about the lower side of the prothoracic lobe; an oblique indentation starting just behind this suture and running down and back a short distance marks a part of the lower limit of the rectangle.

Petiole: First segment dull ferruginous, sometimes darker above; second segment ferruginous, generally with a darker median streak above for more or less of its length.

Abdomen: First segment ferruginous; the second may be the same but is usually darker above, behind; third segment sometimes more or less fer-

ruginous beneath and on its sides, but it is usually black like the remaining segments which often have a bluish reflection.

Wings: Semihyaline to slightly fuliginous; veins brown, the larger ones the darker; third cubital cell tending toward rectangular, but sometimes more nearly triangular. Tegulae dark ferruginous or reddish brown, darkest in front.

Legs: Black to piceous, quite whitish sericeous; hairs light; spines dark; claws reddish.

MALE.—Unknown: may possibly be *alticolus* if this should prove to be different from *junceus.*

LENGTH.—Females, 17-22 mm. Cameron gives the length of the type as 23 mm. My measurement of it gave 19 to 20 mm. About twenty specimens studied.

DISTRIBUTION.—Cameron's type is from Panama. I have seen specimens from Guatemala (Jan. 12); Mexico (12 specimens, all without locality except one which was taken at Tuxpan, Jalisco ,Sept. 3); Lower California; California (San Diego) and Tucson, Arizona, October 1. I am not quite satisfied that the specimens from Lower California, San Diego and from Tucson are really this species though I can make nothing else of them.

TYPE.—The confusion of the type labels of *chiriquensis* and *alticolus* at the British Museum has already been discussed under the latter species (see page 152). I think that in putting his labels bearing the word "Type" on these two specimens Cameron accidentally reversed them.

This species so closely resembles the female of *junceus,* established as such by a mated pair, that for a long time I regarded them as the same, explaining the differences as due to the specimens having been taken in widely separated regions. This view may yet prove to be correct. At present I separate them mainly by the differences in the outline of the clypeal margin and the color of the first segment of the petiole.

33. **Sphex strenuus** (Cresson).

**Ammophila strenua* Cresson, 1865, Proc. Ent. Soc. Phila., vol. 4, p. 459, female.

Ammophila strenua Melander, 1903, Psyche, vol. 10, pp. 157, 161, 163, female.

Sphex strenuus Mickel, 1917, Univ. Neb. Studies, vol. 17, p. 405, female, male.

Over medium size. Head, thorax, first segment of the petiole, all but the first two segments of the abdomen, and the legs, black, the last sometimes a little brownish outwardly. Pubescence white, sometimes with a faint golden tinge. Pilosity generally black on the head and often on the thorax; white elsewhere. Sericeous hairs white. Wings somewhat fuliginous.

FEMALE.—*Head:* Somewhat quadrangular from above though the cheeks are not full enough laterally to complete this outline; rather oblong-oval from in front, the sides of the oval (top and bottom of the head) rather flattened from a true oval. Clypeus broad, somewhat swollen centrally, its lower margin divided about into fourths by the teeth, the space between these forming about half of the margin; medially with a slight notch and a small, smooth rim having a sinuate outline; lateral to the teeth the margin curves outward or even slightly downward and outward to below the eyes; surface sericeous to pubescent, punctured, and with long, erect hairs. Frons quite depressed at the antennal fossa but only slightly so above; median indented line evident to, and all around the ocelli, the side branches continued a little more backward onto the vertex to an indentation there; surface of the frons sericeo-pubescent at the sides and well toward the middle below, but less so above, not extending up as far as opposite the median ocellus; the rest of the surface shagreened, slightly black sericeous, with scattered punctures and long, erect hairs. Ocelli not quite forming an equilateral triangle. Vertex slightly higher than the ocelli, evenly rounded from side to side, its surface sericeous and with hairs like the frons. Cheeks quite full behind, less so laterally, white sericeous behind the eyes, well upward; with many long, erect hairs below and behind. Antennae black, but the scape sometimes shows a trace of resinous beneath.

Thorax: Collar broad in profile at the base, rising in a gradual and even curve well toward the back of its top before bending slightly downward, then turning down quickly to form the back; evenly rounded from side to side; lateral indented line evident but not strong, running into the gutter a little below the upper end; gutter generally nearly smooth, with a few fine striae and punctures; rarely these striae are quite strong and extend somewhat above the gutter; front margin of the gutter weakly developed; surface of the collar white sericeous, with scattered, fine punctures and erect hairs, black, white or mixed; prothoracic lobe pubescent. Mesonotum also whitish sericeous, with fine punctures and rather short, erect hairs. Scutellum varying from smooth and shining, with scattered, fine punctures, to slightly ridged behind and at the sides. Postscutellum closely punctured giving it a confused appearance. Propodeal disk with a median longitudinal band irregularly ridged, with punctures between and somewhat sericeous; at the sides the ridges run obliquely backward, but farther back they

run more outward, particularly toward their ends; end with a pubescent spot between the petiole and the metacoxal knob, extending upward and becoming sericeous or ending before becoming so; transverse ridges on the end turn down and become vertical at the sides of this part; the surface with erect hairs; sides rather coarsely but not closely ridged, with punctures between, running downward and perhaps slightly forward and rather irregularly; surface with long, erect hairs, the ridges sometimes nearly obsolete in front. Metapluron with coarse punctures tending to form rows, and sometimes with traces of ridges; a weak pubescent band, sometimes almost lacking, runs from the metacoxal knob forward along the suture toward the triangle without reaching it; much of the surface of the plate is more or less sericeous and bears long hairs. Mesopluron coarsely punctured, with a well developed pubescent band from the mesocoxal knob along the suture to the subalar area, more or less completely covering the rectangle; much of the plate quite sericeous in fresh specimens, especially just behind and below the prothoracic lobe; episternal suture running straight down to the underside of the body; a short, indented line not connected with the suture marks most of the lower end of the rectangle.

Petiole: First segment black; the second ferruginous, darker at its base and front of the sides.

Abdomen: First two segments ferruginous, the second usually with dark shades; the remainder generally black, sometimes with a bluish reflection, though ferruginous areas occasionally occur beneath on the third segment; surface minutely shagreened.

Wings: Somewhat fuliginous; veins piceous, the larger ones black; second cubital cell usually wide behind and the third tending toward triangular. Tegulae piceous to black.

Legs: Black; whitish sericeous; coxae somewhat pubescent above; spines black; hairs on the fore femora and tibiae black; claws dull ferruginous or light brown.

Male.—Unknown. It has been suggested that *junceus* might prove to be the male, but the capture of a male *junceus* mated with a female not *strenuus* shows that this is not the case. *Transversus* n. sp., or *dubius* n. sp. may perhaps be the male though the short episternal suture of the former is against it.

Length.—Females, 19-25 mm. About 25 specimens studied.

Distribution.—I have seen specimens from Washington; Utah; Colorado (July and August); New Mexico (June, August); Arizona (June, August); and Mexico (Meadow Valley and unnamed localities.)

Type.—Cresson described this species from a single female captured in "Colorado Territory." This specimen, labelled "Type

No. 1928" is in the collection of the American Entomological Society.

This species is particularly difficult to distinguish from several others, there being few fixed characters available. In general I have found that a smooth or nearly smooth scutellum, the presence generally of a particularly dense sericeous area just behind and below the prothoracic lobe, the black pilosity on the head and sometimes on the pronotum, and its size are the first characters to look for. Yet any or all of these may not always hold and only a careful examination of the entire insect and a summation of all the characters can finally determine it. I have carefully studied the type on four different occasions but fail to find any one feature which can always be depended upon by which to conclusively identify the species.

34. **Sphex dubius** n. sp. (Figs. 5, 27).

Black except the second petiole and the first two abdominal segments which are ferruginous with black markings. Pilosity of the clypeus black or white; on the cheeks, white; on the rest of the head, black; on the rest of the body, white, quite long and fairly abundant on the sides of the thorax except the prothorax. Pubescence white. Body quite generally, though not very densely, white sericeous. Wings slightly fuliginous. Legs black.

MALE.—*Head:* Rather quadrangular from above, the cheeks not quite full laterally though fairly so backward; frontal depression and occipital fossa not noticeably constricting the head medially; from in front irregularly, broadly oval but with the main axis of the oval above the middle of the head. Clypeus quite long, flat except below, where it is flexed forward somewhat; lower margin with two quite strongly developed teeth or bluntly pointed projections near together, the space between deeply excavated and the surface above this depressed; lateral to the teeth the margin runs quite straight out and up, finally turning outward below the eyes; surface white pubescent, continued well upward on the sides of the frons; long hairs on the clypeus and frons either white or black. Frons rather closely, finely punctured; frontal depression slight; median indented line evident up to, and forking, beside the ocelli but with no cross line behind them. Vertex raised enough immediately behind the ocelli

to prevent its being evenly rounded from side to side; but little higher than the posterior ocelli. Ocelli too far apart behind to form an equilateral triangle. Cheeks slightly sericeous behind the eyes and with many long, white hairs. Antennae black to somewhat piceous. Surface of the head with medium close, rather fine punctures.

Thorax: Collar at first rising sharply from the neck but soon rounding evenly backward to its highest point just in front of where it turns quickly downward to form its hinder surface; with scattered, fine punctures and generally somewhat sericeous above; evenly rounded from side to side; lateral indented line not strong, but evident to the middle of the gutter a little below its top; gutter smooth or slightly ridged with a weak elevation limiting it in front. Mesonotum sparsely, finely punctured, somewhat sericeous; its front face slightly depressed medially so that the back of the collar seems to project backward a little into this depression. Scutellum with a very few weak, fine ridges at its sides; with scattered, fine punctures. Postscutellum with a few punctures; rather shining. Propodeal disk with a somewhat irregularly punctured median band; the lateral ridges in front running almost directly backward and bending outward only very slightly at their ends; bending outward more behind the spiracle but running more nearly backward again near the end; surface of the median band slightly sericeous; end with a pubescent spot between the petiole and the base of the metacoxal knob and extending upward, but not reaching the disk nor turning inward above the petiole; surface rather smooth around the spot, it being only very little punctured; side weakly ridged, perhaps more by punctures in rows than by real ridges, and this condition is lost toward the front where the punctures become irregular; surface with traces of sericeous. Metapluron without ridges but sometimes with a few of its punctures in rows, these coarser, if anything, than the mesoplural ones; a weak pubescent band runs from the metacoxal knob a short distance along the propodeo-metaplural suture; surface with traces of sericeous; triangle finely ridged. Mesopluron with a well developed pubescent band from on the mesocoxal knob forward along the meso-metaplural suture, sometimes to the subalar area but often disappearing at the base of the rectangle or even earlier; surface rather sparsely, medium coarsely punctured and more or less sericeous; episternal suture running nearly straight down to the underside of the body which is sericeous; an indented dash, not connected with the suture, marks a part of the lower end of the rectangle.

Petiole: First segment black; second ferruginous except for a median, dorsal, black band and dark shades along the lower part of the sides.

Abdomen: First segment ferruginous, with a median, dorsal, black streak, not always present in front; second segment similar and sometimes with a broadening of the black behind; remaining segments black

(third segment ferruginous below in one case seen); often with a bluish reflection.

Wings: Somewhat fuliginous; veins brown; second cubital cell liable to be wide both behind and in front and the third liable to be nearly triangular, the second and third transverse cubital veins almost meeting on the radial vein in that case. Tegulae black.

Legs: Black, somewhat sericeous everywhere; spines black; claws tending toward ferruginous outwardly.

FEMALE.—Unknown. Can this be the male of *strenuus?*

LENGTH.—Males, 18-25 mm. Five specimens studied; probably more seen before I recognized this as a new species (see below).

DISTRIBUTION.—Specimens thus far seen were captured in "Col.;" New Mexico (Jemez Sprgs., 6400 ft. June 31) and Arizona (Flagstaff, June 25, and "So. Ariz., Aug.").

TYPES.—Described from three specimens: the Holotype and one Paratype from Colorado in the American Entomological Society collection; the other Paratype from S. Arizona, in my own collection.

In some ways this species much resembles large specimens of *arvensis* and it is possible that in my earlier work I have so named some of the material that passed through my hands. It may be distinguished from that species by the deep central excavation and side projections of the clypeal margin, and the smooth scutellum. It also resembles *trichiosomus* somewhat, but here, too, the clypeal margin is different. The almost entire absence of plural pubescence in *trichiosomus* is also a distinguishing character.

35. **Sphex transversus** n. sp. (Figs. 18, 38).

Of somewhat more than average length and rather slender. Head, body, first petiole segment, abdomen except the first two (rarely three) segments, and the legs, black, the last often with a brownish tinge. Second petiole segment (at least partly) and the first, second and sometimes the third abdominal segments ferruginous, but frequently, at least, not wholly so. Pilosity white, tending to darker on the head; quite abundant and long. Body as a whole quite sericeous, in many places so dense as almost to become pubescence; white; true pubescence is present

on the clypeus, frons, prothoracic lobe, along the hinder margin of the mesopluron; a trace on the hinder margin of the metapluron, and on each side of the base of the petiole. Wings semihyaline to slightly fuliginous, sometimes with a faint yellowish tinge.

MALE.—*Head:* From above slightly hour-glass shaped, its sides being quite rounded and the frontal depression and occipital fossa evident though not strong; from in front broadly oval, the lower end of the clypeus projecting somewhat below this outline. Clypeus quite flat, its lower margin bent very slightly forward, sometimes on its extreme edge forming a narrow rim, its central half or more transverse, sometimes with a very slight median indentation or emargination, the edge lateral to this bending only a very little upward for about half of its length, then turning sharply upward, then outward below the eye, thus forming a strong emargination there (see under Variations, also); surface densely pubescent to the antennal articulations and on the sides of the frons above them; with many long, erect hairs. Frons broadly but not greatly depressed, its median indented line evident as are also its forks beside the ocelli and behind them a short distance, but the cross line behind the ocelli is often absent: frons surface shagreened, with many fine punctures except near the front ocellus; with many long, erect hairs. Lateral ocelli practically on the vertex, much too far apart for the three to form an equilateral triangle. Vertex evenly rounded from side to side, shagreened, punctured and with erect hairs. Cheeks not full laterally, fuller behind; with traces of pubescence behind the eyes; with numerous fine punctures and long, erect hairs. Antennae black, sometimes slightly brownish, the scape with a trace of whitish sericeous beneath. Mandibles black with a faint, dull ferruginous band across the middle.

Thorax: Collar rising sharply but not quite at right angles to the neck and only very slightly rounding backward till near the top where the curve becomes much greater to its highest point close in front of where it bends abruptly downward behind; in profile it is considerably higher than wide at its base; evenly rounded from side to side; indented lateral line quite strong, running about to the middle of the gutter and entering a little below its top; gutter broad, smooth, its front limit weakly marked by a rather flattened ridge; surface of the collar shagreened, finely but not closely punctured, sericeous and bearing short, erect hairs; prothoracic lobe pubescent. Mesonotum surface rather closely punctured; with many rather short, erect hairs. Scutellum varying from nearly smooth with a few fine punctures, to smooth in the middle in front but ridged at the sides and behind. Postscutellum quite closely punctured. Propodeal disk with a median sericeous band nearly as wide as the disk in front but

narrower behind; surface of the disk finely ridged, the front ridges nearly transverse, those farther back more oblique; end nearly covered by pubescence but evidently finely punctured; it, the sides, meta- and mesoplura all thickly covered with long, erect hairs; sides punctured, the punctures in places tending to form rows running down and slightly forward. Metapluron with medium sized punctures and a slight pubescent band starting on the metacoxal knob and running forward along the propodeo-metaplural suture a varying but rather short distance; this band generally grades into sericeous on its lower side and the whole plate is more or less sericeous, most strongly so posteriorly; its surface with many medium sized punctures; its triangle punctured and at most with only faint traces of ridges. Mesopluron sculptured about like the metapluron; with a pubescent band along the meso-metaplural suture to the top of the rectangle but often not covering the entire width of this portion; episternal suture weak, slightly curved, sometimes weakly angulated and giving off an indented line like itself, which runs a short distance backward forming the front part of the bottom of the rectangle; the suture itself becomes only an indented line soon after its beginning above and ends about opposite the lower part of the prothoracic lobe.

Petiole: First segment much longer than the hind coxa and trochanter together; black, but sometimes with a ferruginous tinge; shining, slightly sericeous above; second segment black or very dark above, more or less ferruginous on its sides.

Abdomen: First segment ferruginous or mingled somewhat with black; second segment varying from all ferruginous to all black, in which last condition the first is blacker than otherwise; third segment generally black but may be somewhat ferruginous, particularly on its sides or below; rest of the abdomen black, rarely with a slight bluish reflection; where the color is black there is usually a fine whitish sericeous, particularly above.

Wings: Semihyaline; sometimes slightly fuliginous and often with yellow veins, giving the wings a yellowish color; veins more often dark; second recurrent vein sometimes interstitial with the second transverse cubital and generally nearly so; second cubital cell not unusually wide behind. Tegulae varying from black, a little lighter behind, to nearly all dull ferruginous or brown.

Legs: Black, the tibiae and tarsi often more nearly chestnut brown; all the leg segments more or less whitish sericeous; hairs and spines light, sometimes quite pale; claws ferruginous.

FEMALE.—Unknown; possibly *strenuus* though the episternal suture in this species runs to the underside of the body while in *transversus* it is short.

VARIATIONS.—The outline of the clypeal margin varies considerably. In some specimens it is practically transverse for nearly its entire length,

turning upward sharply only when nearly out to below the eyes; in other cases there may be a slight median notch or even a small emargination; lateral to the median line, whatever there may be there, the outline may be nearly straight but not quite transverse, rising slightly, outwardly, before turning upward sharply, and in some cases there is an actual angle instead of a bend where this turn is made. Variation in the distribution of color on the abdomen has already been indicated. In some cases the insect is much darker than in others, and less pilose.

LENGTH.—Males, 20-25 mm. About thirty specimens studied; numerous others examined less carefully.

DISTRIBUTION.—Specimens of this species have come to my notice from Heppner (July 10) and Hermiston (June 23), Oregon; Palo Alto (August 23), Jacumba, San Diego Co. (August 8), and other unnamed places in California; Warren, Idaho; Pierre, South Dakota; Colorado (no localities given), and Beaver Valley, Utah.

TYPES.—Described from a Holotype from Beaver Valley, Utah, in my collection, and five paratypes; one from Beaver Valley, also in my collection; one from Pierre, South Dakota, in the American Entomological Society collection; two from Colorado in the U. S. National Museum collection, and one from Heppner Junction, Oregon, in the Oregon Agricultural Experiment Station collection.

When the wings veins in this insect are yellow it somewhat resembles large specimens of *harti* but the difference in clypeal outline will separate them. It also somewhat resembles the gray specimens of *aberti* but here also, the outline of the clypeal margin is distinctive though in those examples where the sides run upward somewhat before making the sharper turn the resemblance is inconveniently close.

I have seen a specimen from Corvallis, Oregon, in which the legs are all entirely black and the episternal suture extends down to the underside of the body, but which in every other regard, as far as I can see, is *transversus*. This raises the question whether the length of the episternal suture is always a reliable character to use in the separation of the species.

36. **Sphex aculeatus** n. sp.

Of medium size. Entirely black except parts of the second petiole segment and of the abdomen which are ferruginous. Pilosity, pubescence and sericeous hairs white. Wings semihyaline to somewhat fuliginous.

FEMALE.—*Head:* Not quadrangular, the cheeks not being full enough laterally, and the front and occipital fossa depressed; yet hardly hour-glass shaped; from in front rather oblong-oval. Clypeus not strongly but quite uniformly swollen over most of its surface; rather coarsely punctured and sericeous to pubescent, with numerous long, white and a few dark hairs; lower margin divided into about thirds by the teeth, the central third slightly reflexed and with a faint median notch; beyond the teeth the margin runs nearly straight outward and a little upward to below the eyes. Frons pubescent beside the eyes up to about half way to the median ocellus but not extending much toward the middle; middle only slightly but broadly depressed; median indented line and its forks evident, but the cross line behind, faint; frons surface shagreened and with numerous short, fine, erect hairs. Ocelli forming a somewhat flattened triangle. Vertex slightly higher than the hinder ocelli, evenly rounded from side to side; its surface shagreened and finely punctured. Cheeks somewhat sericeous behind the eyes; sparsely punctured above; with long white hairs below. Antennae black, the scape faintly resinous below.

Thorax: Collar quite broad at its base, rising quite evenly in a backward slope to a narrow top and dropping behind, a little more sharply, its top evenly rounded from side to side; lateral indented line weak, extending to the upper part of the gutter which is deeper than usual, slightly sericeous as is the entire collar which is also finely punctured and bears erect hairs; gutter possibly finely striated; prothoracic lobe lightly pubescent. Mesonotum somewhat closely punctured, the punctures medium to small, and sometimes forming rows here and there; rarely there are a few fine, transverse ridges; surface somewhat sericeous and bearing short hairs. Scutellum rather smooth; with a few punctures in front; weakly, longitudinally ridged at the sides and behind and in some cases entirely ridged. Postscutellum rather high across its middle, its surface confused. Propodeal disk a little raised medially in front, with a very indefinitely limited, punctured median band; the disk rather coarsely ridged, the ridges running obliquely in front, more transversely behind; most of its surface shagreened; end pubescent below, sericeous above, side sericeo-pubescent but where exposed showing rather close punctures which tend to form rows running down and slightly forward; sometimes short dash-like ridges occur. Metapluron sericeo-pubescent, heaviest from the metacoxal knob along the suture to about under the spiracle; surface punctured and

possibly with short, dash-like ridges; triangle finely ridged, the ridges running forward but only slightly downward. Mesopluron sericeo-pubescent, most strongly along the suture from the mesocoxal knob up to and along the hinder side of the rectangle nearly to the subalar area; episternal suture running straight down to the underside of the body except for a slight emargination forward about opposite the middle of the prothoracic lobe; entire under surface of the thorax sericeous.

Petiole: First segment black, slightly sericeous but shining somewhat; second segment dark above and at its sides near its front; ferruginous elsewhere.

Abdomen: First two to four segments ferruginous with darker shades or spots above; rest of the abdomen black with a bluish reflection in some lights; surface faintly sericeous.

Wings: Only slightly fuliginous; veins brown; second cubital cell of about medium width behind. Tegulae dark reddish brown, lighter behind; slightly sericeous in front.

Legs: Black, faintly resinous or brownish outwardly; sericeous everywhere; coxae pubescent above; spines black or dark; hairs on the fore femora and tibiae long, white; claws light resinous outwardly.

MALE.—Differs as follows: Vertex rather flat in the middle so that the hinder ocelli are practically on the periphery of the head viewed from in front; clypeus with a median, narrow, rather deep emargination—almost a notch,—lateral to which the margin runs almost straight up and out to below the eye. Profile of the collar more rounded than in the female. First abdominal segment frequently with a median dorsal black streak; perhaps more often, wholly ferruginous; dorsal plate of the third and hinder segments black. Second cubital cell broader than the average behind but not markedly so. Small leg spines whitish. Episternal suture either without the emargination or it is very slight.

LENGTH.—Females, 18-22 mm.; males, 17-20 mm. Fifteen females and five males studied. I fear that early in my work some specimens of this species were returned to their owners marked *strenuus*.

DISTRIBUTION.—I have seen specimens of this species from Colorado and Utah, but nearly all were taken in Oregon and California. Dates of capture: Colorado, June 14, July 26 and a mated pair September 15; Utah, August 24; Oregon, June 13, 23, August, October 1; California, Ontario, June 10, July 20; Pasadena, August 13, San Jacinto Park, August 21, Mt. Wilson, September 14, and Amedee, August 22.

TYPES.—Described from a mated pair; female Holotype and male Allotype, taken by Prof. Chas. H. Hicks at Owen's Lake, Boulder Co., Colorado, September 15, 1932; in my collection; a male and a female paratype in the Stanford University collection;

a female paratype in the Cornell University collection; a male paratype in the U. S. National Museum collection; and a female paratype in the American Entomological Society collection; three female and two male paratypes in all.

In some ways this species closely resembles *strenuus* and in others some forms of the *arvensis* group. Is it possible that it is a Pacific Coast form of that assemblage?

37. **Sphex novitus** n. sp. (Figs. 30, 33).

Head black, body black with ferruginous areas. Petiole and abdomen ferruginous though sometimes with black or dark markings. Legs ferruginous, occasionally with darker areas or markings. Wings semihyaline to hyaline. Pilosity, pubescence and sericeous hairs white. Rather slender insects of medium size for the group.

FEMALE.—*Head:* Somewhat quadrangular from above though the cheeks are not quite full enough, either laterally or behind to entirely satisfy this outline; from in front the outline is quite oval when the mandibles are closed. Clypeus densely pubescent, ferruginous under this where exposed; bearing scattered punctures and white hairs; lower margin divided about into thirds by the teeth; with a faint median notch and sinuate edge between them; lateral to the teeth the margin curves upward a little, then outward nearly horizontally to below the eyes. Frons strongly depressed at the antennal fossa but broadly and very shallowly so above; median line quite strong, running up to the front ocellus and forking, and with a cross line behind the ocelli; frons surface pubescent, grading into sericeous above, which extends almost to the ocelli and nearly to the median line, thus practically covering almost all of it. Ocelli forming the corners of an almost equilateral triangle. Vertex quite high behind the ocelli, too high to give an even curve from side to side; shagreened and finely sericeous. Cheeks sericeous above, becoming pubescent below, particularly near the eyes; bearing long hairs below and behind. Antennae black except the scape and pedicel which are somewhat resinous and shining. Mandibles light ferruginous to the base of their teeth; black beyond.

Thorax: Collar long, rising rather sharply from the neck for a very short distance, then turning quite sharply backward and slightly upward and curving slightly to its highest point which is nearly at its hinder end where it turns sharply down to form its hinder face; using the lateral indented line as a base, the collar is longer than high in profile; top evenly, only slightly rounded from side to side till well out, then turning down

almost vertically to the indented lateral line and the gutter; lateral indented line distinct but not deep, running back to the prothoracic lobe and practically marking the top of the gutter which is not well defined, particularly in front; surface of the collar smooth, shagreened, and quite densely sericeous; with a few fine punctures; prothoracic lobe densely pubescent, sometimes, at least, ferruginous under the pubescence. Prosternum similarly covered. Mesonotum coarsely, transversely ridged, the ridges not crossing the median line; from opposite the tegulae back they run somewhat obliquely backward and inward; between the ridges the surface is somewhat shagreened and sericeous and with a sericeous, almost pubescent spot just inside the tegula and wing base. Scutellum ridged longitudinally in the middle, slightly obliquely at the sides; sericeous. Postscutellum punctured, possibly slightly ridged, sericeous. Propodeal disk with a median sericeous band narrowing behind; surface ridged at the sides of the band, the ridges in front running strongly backward and outward, not curved; behind the spiracle their ends bend more outward and are coarser and the surface shining; the hinder ones are nearly transverse; end with a densely pubescent spot from beside the petiole out onto the hind coxal knob and up to the tip of the disk; side ferruginous behind, turning dark to black farther forward, particularly below; sericeous, especially near the disk; rather finely, but not closely ridged, the ridges running down and a little forward behind, down and strongly forward in the middle and front, suggesting the condition found in *Sphex gucrinii;* the distribution of the ferruginous varies somewhat; the surface with a few, short, erect hairs; spiracle rim light. Metapluron pubescent behind, becoming less dense forward but including the triangle; surface markings concealed but with few or no erect hairs; the metacoxal knob and the triangle in some cases at least may be partly or wholly ferruginous. Mesopluron black everywhere, sericeous but not as densely so as the metapluron; mesocoxal knob at least sometimes ferruginous; where exposed by wear the mesoplural surface is rather sparsely, coarsely punctured; rectangle sericeous; episternal suture running straight down to about opposite the bottom of the prothoracic lobe; an oblique, weak, depressed line, sometimes apparently a branch of this suture, runs a short distance down and back from about opposite the middle of the lobe and an actual connection of it with the lobe is possible in some cases; subalar area ferruginous; entire under surface of the thorax densely sericeous.

Petiole: Both segments light ferruginous, the second sometimes with a dark dorsal streak on more or less of it; petiole about as long as the hind coxa, trochanter and femur together. Petiole and abdomen slightly sericeous.

Abdomen: Segments light ferruginous with a dark or black dorsal spot on the fourth, and perhaps, sometimes elsewhere; fifth sometimes black above.

Wings: Almost hyaline; veins brown; end of the radial cell slightly pointed near the costa; second cubital cell of about the usual width or a little more, behind. Tegulae ferruginous.

Legs: Ferruginous, rather sericeous but shining; hind coxae pubescent above; hind trochanter and femur with a dark streak above; spines ferruginous; hairs pale; claws ferruginous.

MALE.—Head, except a part of the mandible; thorax; first segment of the petiole; hinder part of the abdomen and parts of the legs, black; remainder ferruginous. Body heavily white sericeous to pubescent; erect hairs white; rather slender for its length.

Head: Clypeus quite flat, even slightly depressed centrally below the middle of the plate; its lower margin broadly, shallowly emarginate; at the sides of the emargination the ends round outward, then upward and outward in about an even curve. Surface of the frons where not covered, bearing a few short hairs. Ocelli not quite as equilaterally placed as in the female; with no evident indented lines enclosing them. Antennal scape black with but a trace of lighter below.

Thorax: Collar long, low, rising very sharply at less than a right angle from the neck and apparently slightly excavated; turning back from this at a sharp angle and running almost straight back, hardly rising at all, its curvature very slight in profile, to its back end, then turning down by a quick curve in front of the mesonotum; its height using the lateral indented line as a base, not much greater behind than in front; its length about equal to the distance of the tegula from the front of the mesonotum; its top broad, only slightly curved from side to side but turning down quickly at last to form a nearly vertical face which extends down to the prothoracic lobe and the lateral indented line; this line evident, running nearly to the base of the lobe; no real gutter present in front of this lobe but the surface there is sparsely punctured where not sericeous; collar in general more or less sericeous but shining where not covered; proplura sericeous and with a few erect hairs. Mesonotum coarsely transversely ridged in front, more curved behind; with a pubescent spot beside the tegula; the whole surface more or less sericeous. Scutellum ridged, the ridges seeming to run back and out around a center near the front on the middle line. Ridges of the propodeal disk concealed along the middle by a sericeous band; at the sides they are rather coarse and near the front run nearly transverse, farther back more obliquely, then more transverse again; sides rather coarsely punctured and with ridges, some of which run quite strongly forward. Third cubital cell quite wide for its height; second transverse cubital vein arched slightly into the second cubital cell. All coxae black; fore and middle trochanters dark but tinged with ferruginous; spines the color of the segment they are on, or lighter; claws ferruginous. Otherwise like the female.

VARIATIONS.—In the four females seen the following variations were noted: The clypeus may not be ferruginous; the mandibles may be only very dull ferruginous; the side of the propodeum may not be ferruginous; the meta- and mesoplura are not always entirely covered by sericeous though traces of it occur, at least; the subalar area and the top of the metaplural triangle may or may not be ferruginous, and the legs may be black with only a trace or spot of ferruginous here and there. In ferruginous legged forms the fore tarsal comb of the female is composed of long, pale, rather slender hairs while in the black legged form it is composed of coarse, stout spines. This last condition I have seen in only one of the four females studied and on that account I have hesitated to place it as this species. As it comes from Lower California, as do two others and the male, however, and differs in no other regards, I have finally left it here. As only one male has been seen no allowance for variation can be made.

LENGTH.—Females, 17-20 mm.; male, 20 mm. Four females and one male studied.

DISTRIBUTION.—Two females from "L. Cal."; one from "San Jose del Cabo, L. Cal." and one from Beaver Co., Utah. The male is from "L. Cal."

TYPES.—The Holotype female and Allotype female from Lower California are in the American Entomological Society collection. The Paratype, from Utah, is in my own collection. The other two females are also in the American Entomological Society collection.

This is a most unusual and striking species. In the form of its collar it is quite unlike any other species I have seen, though it most nearly resembles *acutus* n. sp. It should be sought for, both in the southwestern United States and in Lower California.

38. **Sphex acutus** n. sp. (Fig. 39).

Of medium size, rather slender. Head, body, first segment of the petiole, legs and hinder end of the abdomen, black. Pilosity (mostly), pubescence and sericeous hairs white. Wings somewhat fuliginous.

MALE.—*Head:* Tending toward quadrangular, the cheeks being fairly full behind and the frontal depression slight; from in front less regular in outline, the vertex being somewhat flattened and the clypeus long. Clypeus extending down some distance, its margin with a small median

emargination, outside which is a similar one, oblique to the median one and lateral to which the margin runs strongly upward and somewhat outward and finally outward to below the eye; surface everywhere pubescent except on the very margin, which is piceous; with few, if any, erect hairs. Frons similarly pubescent, this extending well up toward the ocelli and quite well inward; frontal depression slight, even at the antennal fossa; median indented line evident though the frons is little depressed, extending to the anterior ocellus and faintly forking around the ocelli in a curve around the anterior one, another curve around the posterior one, and a transverse, outwardly curved line behind; the surface not covered by pubescence is black sericeous and not shining; shagreened and with a few very fine punctures and short, erect, black hairs; on the pubescent areas are longer, erect, white hairs. Posterior ocelli very nearly at the vertex which shows only slightly above them. Vertex rather flatly rounded from side to side though highest in the middle; its surface like the black portion of the frons. Cheeks quite broad but not projecting laterally as far as the eyes nor far backward; with a definite pubescent band along the hinder margin of the eye nearly to its top; behind this are many long, white hairs. Antennal scape finely whitish sericeous.

Thorax: Collar longer than usual but not as long as in *novitus*, rising at first sharply from the neck, almost tipped forward and flat across; it then turns backward and slightly upward, forming a sharp angle with the erect part, and extends backward some distance before turning sharply downward behind, its sides, seen from above, broadly rounded; lateral indented line quite strong, running to the upper front part of the gutter which is rather broad above and bears a few scratches on its lower half; its front somewhat raised as a weak, broad ridge; surface of the collar quite sericeous above, less so on its sides, and with a very few weak ridges just above the gutter. Mesonotum somewhat sericeous, not concealing the surface beneath which is shagreened and has fine, scattered punctures; near its front corners are traces only, of short transverse ridges. Scutellum nearly smooth in front; with a few fine punctures; somewhat ridged longitudinally behind; sericeous? Postscutellum slightly sericeous; with a central transverse ridge rather higher than the rest of the plate. Propodeal disk confused along a median band having nearly transverse, rather fine, short and long ridges with punctures and more or less sericeous; at the sides behind the spiracle the ridges become more regular but the confused band is much wider than usual; end with a broad, pubescent, rather rectangular spot between the petiole and the metacoxal knob and running up to above the top of the petiole where it becomes sericeous and extends up to the sides of the disk, but not concealing rather coarse ridges which run downward and even slightly backward to the metaplural suture; sides similarly ridged, the ridges running downward and slightly forward rather irregularly and with coarse punctures between;

the whole area thinly sericeous; no erect hairs perceptible though punctures imply their presence. Metapluron similarly coarsely ridged, the ridges not entirely straight but wavering slightly; with occasional punctures but no perceptible hairs; the whole plate somewhat sericeous; denser almost to pubescence from the base of the metacoxal knob and the depression in front of the coxa forward as a narrow band along the propodeo-metaplural suture to a point in front of below the spiracle. Mesopluron thinly sericeous except for a pubescent band from the mesocoxal knob along the meso-metaplural suture to the top of the rectangle; subalar area sericeous; surface, where exposed, with somewhat irregular, discontinuous, vertical ridges, punctured somewhat between them but with no hairs visible; episternal suture slightly curved, the arch backward, extending down to the underside of the body; a small, oblique indentation, strongest behind, marks most of the base of the rectangle.

Petiole: First segment black; second ferruginous except near its base and perhaps at its hinder end beneath.

Abdomen: First two segments and part of the third, ferruginous; the rest black with a bluish reflection.

Wings: Slightly fuliginous; veins dark brown; second cubital cell rather wide behind; third transverse cubital vein running strongly forward and inward, joining the radial vein close to the second and leaving the cubital vein at an angle, thus making the third cubital cell a triangle. Tegulae shining black.

Legs: Black; quite sericeous; spines black; claws resinous to ferruginous.

FEMALE.—Unknown.

LENGTH.—Males, 19-20 mm. Only two males seen.

DISTRIBUTION.—New Mexico "Jemez Sprigs, 6400 ft. 6, 26, '16, John Woodgate;" "S. Arizona, Aug. 1902, F. H. Snow."

TYPES.—Described from these two specimens, the Holotype, from S. Arizona, in my collection; the Paratype, from New Mexico, in the Cornell University collection.

This species in the form of its collar, its general sericeous covering, and in other ways much resembles *novitus*. But the episternal suture is long instead of short and there are other differences and I therefore think it best to consider it a new species.

UNRECOGNIZED SPECIES

Among the species of Sphex which have been described, those of Lepeletier remain unrecognized by me. Many guesses as to

their identity have been made but as significant and distinguishing characters are almost entirely lacking in his descriptions only a study of the specimens he described from can show what they really are. Some of his specimens are at Turin, I am informed, and Dr. J. C. Bradley, who has examined them there, has kindly sent me a list of them. Unfortunately only five are on this list and none of these is American. So until Lepeletier's American type specimens can be found, uncertainty as to what they are will remain.

Lepeletier's list of names for North American *Ammophilas* (now *Sphex*), excluding those now placed in the genus *Podalonia,* is as follows: *abbreviata, procera, gracilis, intercepta, urnaria* and *arvensis.* Some of these he assumed (to judge from the names) were the same as species described by earlier writers, but even this cannot be accepted as certain.

Of Cameron's species I fail to recognize three, and a fourth I could not find in the British Museum collection. Though I studied *azteca, dejecta* and *nigrocaerulea* there and made full notes on them I have found nothing like the first two in the material which has gone through my hands, and of the third, only one or two specimens which suggested that species though not agreeing well with it. I have no idea what the missing species, *picipes,* is like as the description is both brief and not significant. I have not included these four species, either in the key nor in the body of this paper, but give below instead, a copy of my notes on the types. However, for the convenience of those who do not have access to the Biologia I include Cameron's own description of *picipes.*

Ammophila azteca Cameron.

Four specimens under that name; one, a female, marked Type in Cameron's writing. Two others come from Orizaba. Female type. Length 17-19 mm. Black except parts of the second petiole and first and second abdominal segments. Pubescence silvery; hairs white, mostly rather short. Wings somewhat fuliginous and evenly so. Head quite quadrangular from above, the cheeks going quite well back. Front broadly but not deeply depressed. Eyes slightly convergent or perhaps parallel. Clypeus slightly

swollen, with numerous, medium sized punctures and whitish hairs; its lower margin running downward somewhat to a slight tooth, then sinuate across the central third to the other, with a slight median notch. No pubescence on the front of the head (worn off?). Antennal fossa quite depressed. Indented median line evident to, and all around the ocelli. Frons rather sparsely and finely punctured. Distance between the outer ocellar margins slightly greater than to the eye. Vertex and cheeks sparsely, rather finely punctured. Mandibles black, piceous toward their tips. Antennae black. Pronotum not ridged, rather sparsely, finely punctured; rising quite sharply from the neck; rather narrow, front to rear, evenly rounded from side to side, with a slight notch at the middle of the top; with a few small ridges in front of and below the prothoracic lobe which is pubescent though not heavily so. Mesonotum with traces of fine transverse ridges on its front corners; top smooth but rather sparsely, finely punctured; shining. Scutel with rather fine longitudinal ridges. Postscutel rather high at its middle third, its surface confused. Propodeal disk with a depressed median line practically its whole length; quite closely ridged, nearly transverse in front, then slightly back and out except the last few which are again transverse; a median band has punctures as well as ridges; end confusedly roughened, with an elongated pubescent spot on each side of the petiole, which continues faintly forward somewhat, on the metapluron along the suture; propodeal sides discontinuously ridged nearly vertically, with punctures, not coarse, between.

A few similar ridges present on the metapluron which bears mainly only medium sized punctures; triangle slightly reticulately ridged above. Mesopluron with a pubescent band from the mesocoxa to the lower hind corner of the rectangle; rest of its surface sparsely, medium coarsely punctured, rather shining; rectangle the same; episternal suture extending below the prothoracic lobe. Petiole about as long as the hind leg to the end of the femur; first segment a little the shorter, nearly straight, glossy black to dark piceous except on the side at its articulation with the second segment where it is ferruginous; second segment ferruginous at its base above and below. First abdominal segment ferruginous except beneath, only the hinder margin of this plate being black, and a black spot on the hinder margin above showing through from the second segment; second segment black except the lateral margins of the dorsal plate; from above appearing entirely black. Rest of the abdomen black. Legs piceous outwardly, the basal segments black. Coxae silvery sericeous; tibial spines light; hairs light; claws and tarsal spines light. Wings somewhat fuliginous, but not strongly so; veins piceous; radial cell rather rounded at its end, nearly half as wide as long. Tegulae piceous, quite light, especially behind. Resembles *incepta* somewhat.

A male found in Cameron's lot, labelled "Orizaba H. H. S. & F. D. G. Dec. 1887;" "Ammophila azteca C" meets Cameron's statements for the

specimen he says is perhaps the male though not marked Type (he never marked both sexes as Type). Length 20 mm. Black or piceous except the second petiole and first abdominal segment. Pubescence silvery. Pilosity long, white. Wings practically hyaline. Head not markedly quadrangular from above; front hardly depressed. Head rather circular from in front. Clypeus somewhat elongate, medially emarginate. A trace of pubescence behind the eyes. Median indented line evident, forking at the ocelli, very faint behind them. Distance between the outer margins of the ocelli greater than from them to the eyes. Collar rather broad and not very high, evenly rounded but rather flat topped in profile; evenly rounded from side to side, not ridged, with numerous rather fine punctures and long hairs. Mesonotum with incomplete small ridges, transverse in front but becoming oblique at the tegulae, and with fine punctures between them. Scutellum longitudinally ridged and rough. Postscutel roughened. Propodeal disk with a median, rather coarsely punctured band; its sides obliquely ridged; sides rough, with incomplete ridges down and somewhat forward. Metapluron simillar but not as rough and the ridges more indefinite. Mesopluron rather closely, medium coarsely punctured. Pubescence on the insect rather coarse and heavy, covering the entire clypeus, sides of the frons, prothoracic lobe, on the mesopluron from the mesocoxa to the top of the rectangle, on the metapluron from the hind coxa more than half way to the triangle, a spot beside the petiole tending to join its mate above, and the upper sides of the middle and hind coxae. First segment of the petiole piceous, almost red beneath its joint with the second; second segment black above, ferruginous elsewhere. First abdominal segment ferruginous except above where it is black continued back from the petiole and narrowing backward; rest of the abdomen black with a slight bluish reflection. Legs black their bases somewhat silvery sericeous, tending to piceous outwardly; the spines lighter, claws light red. Antennae black, scape rather piceous. Type from Mazatlan, Mex.

Ammophila dejecta Cameron.

One male specimen labelled "Ammophila dejectus Cam. Type" in Cameron's writing. Length, 19 mm. (Cameron says 17—18 mm.). Head and thorax black; petiole and abdomen partly ferruginous. Wings semihyaline, a little fuliginous beyond the cells. Legs black, perhaps slightly piceous outwardly. Pubescence golden on the head, more silvery on the thorax. Pilosity quite abundant and long, whitish. Head not quadrangular from above, the eyes reaching far back. Front very hairy, viewed from above, apparently very littie depressed. Head rather oblong-oval from in front; ocelli nearly on the highest point. Clypeus seemingly more elongate than in *cora* but the margin with about the same outline: a side edge view would probably show its lower half bent somewhat forward;

covered with pale golden pubescence extending about half way up the sides of the frons and in to the sides of the antennae but narrowing somewhat from there upward; exposed surface of head with rather numerous, fine punctures and many long, whitish hairs more yellowish on the clypeus and frons than elsewhere, this holding for the vertex and cheeks. Indented median line evident to the ocelli and forking, but no trace of a cross line seen behind. Distance apart of the outer margins of the ocelli greater than from them to the eye. Mandibles slightly reddish piceous, darker toward their tips. Antennae blackish (dirty!). Pro- and mesonotum not ridged, the collar evenly rounded from side to side, rising straight up, then broadly rounded in profile; indented lateral line faint; surface with quite numerous fine punctures; almost sericeous and with many long hairs. Prothoracic lobe golden-silvery pubescent. Mesosternum surface with numerous fine punctures and quite thickly clothed with hairs. Scutellum rather faintly and finely punctured and faintly longitudinally ridged. Postscutellum the same. Propodeal disk nearly all transversely ridged rather finely, and punctured between the ridges well out towards the sides; hinder ridges bend backward slightly, then outwardly; surface somewhat hairy, the hairs quite short; no median line or ridge; sides as far as can be seen rather closely, medium finely punctured and quite thickly pilose; a little ridged nearly vertically near the hind end. Possibly a silvery spot at the side of the disk in front of the spiracle. End with a pubescent spot on each side of the petiole, running outward and then forward along the propodeo-metaplural suture on the metapluron as a band to about under the spiracle; the plate quite closely, finely punctured; triangle the same. Mesopluron with a pubescent band from the mesocoxa up onto, but not to the top of the rectangle; surface punctured like the metapluron. Episternal suture pretty straight down to the lower corner of the rectangle where it ends. First segment of the petiole slightly more bent than usual, reddish (almost ferruginous) piceous above and on the sides, really ferruginous below and at its outer end; second segment ferruginous except for a dorsal black band which stops just before the end. First abdominal segment ferruginous except for a dorsal black band on more or less of the hinder part of the plate; second segment ferruginous except a large black spot above not quite reaching the front margin; rest of the abdomen black. Wings rather hyaline (dirty, though), a little fuliginous beyond the cells; third cubital cell by no means as wide as the second, comparing top with top and bottom with bottom; veins rather dark, the larger ones quite so, the smaller ones slightly reddish piceous. Tegulae piceous, more reddish behind. Legs quite silvery or white sericeous, the middle and hind coxae almost pubescent above; tibial and tarsal spines rather light colored; claws reddish. Type from N. Sonora, Mex.

Ammophila nigrocaerulea Cameron.

Two Biologia and four Godman-Salvin specimens are in the British Museum collection. One female marked "Ammophila nigrocaerulea Cam. Type" in Cameron's writing. Length, 21 mm. Body black; first petiole segment black; second partly ferruginous; first abdominal segment ferruginous with traces of black; rest of the abdomen black with a bluish reflection. Head with the same reflection, as are also parts of the thorax at certain angles. Legs black to reddish piceous. Wings nearly hyaline, slightly fuliginous except (?) in a band near the outer row of cells. Pubescence silvery; hairs black on the head and front of the thorax; finer and brown, behind; nearly all of the head and thorax finely shagreened. Type from S. Geronimo, Guatemala.

Head quite quadrangular from above, slightly depressed in front. Vertex broadly high behind the ocelli. Clypeus a little swollen, its margin divided by the teeth into thirds; the space between them sinuate; surface sparsely pubescent; with rather few, medium sized punctures and long, black hairs. Traces of pubescence up the sides of the frons a short distance. Frons densely bluish; shagreened. Median depressed line quite strong to the front ocellus, weaker on its fork and not perceptible behind; fairly many slender black hairs present, much finer but nearly as long as on the clypeus. Vertex quite high and broad behind the ocelli. Distance between the outer margins of the ocelli equal to or less than to the eye; in some lights shadows suggest an oval elevation behind the ocelli; few hairs on the vertex. Cheeks quite smooth, with some small hairs, particularly below. Mandibles somewhat reddish piceous, nearly evenly colored. Antennal scape faintly reddish piceous. Collar evenly rounded from side to side, rising evenly from the neck in profile to a top rather narrower than usual, then turning down behind, not very close to the mesonotum; its surface sericeous, bluish in some lights, black otherwise; no punctures show, but a few slender, rather long hairs. Prothoracic lobe rather heavily pubescent; with a slight golden tinge to the silvery. Mesonotum densely sericeous, not ridged; surface with a few short, fine, erect, black or blackish hairs. Scutellum rather broad, front to rear, dropping down sharply behind; with a trace of a median groove and very minute, somewhat radiating ridges near the hinder margin. Postscutellum rather confused in the middle; with traces of fine transverse ridges at its sides: these two plates only a little if at all sericeous, true also of the propodeal disk. Propodeal disk closely and rather finely ridged; with a slight central depression on the posterior half; center and all in front of the spiracle more punctured but grading off so there is no distinctly limited median band; front ridges transverse; those opposite the spiracle bending back, then out; hinder ones a little more transverse again; almost glossy black: end with a silvery

spot on each side of the petiole; side with fairly strong discontinuous ridges downward and a little forward; with numerous punctures. Mesopluron with a rather large, somewhat triangular silvery patch along the suture from the middle coxa to or onto the base of the rectangle and down and well forward toward the middle; rest of the plate rather sparsely and finely punctured; traces of nearly horizontal ridges are present on the rectangle; the plate has a slight central swelling but no projection such as in *miliaris:* episternal suture running down quite straight to a little below the middle of the prothoracic lobe, then turning a little forward for a short distance and becoming faint; a triangular depression just at and above this bend forms a part of the lower limit of the rectangle. First petiole segment nearly straight, black or piceous, its end on each side of its articulation with the second segment with a ferruginous spot: second segment ferruginous, with a black dorsal band extending slightly down on the sides and perhaps stopping just short of the end; color beneath, reddish piceous near its base, ferruginous behind. First abdominal segment ferruginous except its extreme hinder margin above, which is blackish, true also of the ventral plate: rest of the abdomen black, bluish sericeous. Wings almost hyaline, shaded a little on the basal half and beyond the cells; the larger veins piceous; the smaller ones pale brown but with no yellow tinge. Radial cell a little bluntly rounded; second transverse cubital vein straight; third cubital cell very broad, extending out nearly as far as the radial cell; second cubital cell not unusually wide behind. Legs black; tarsi slightly reddish in some lights: hind coxae almost silvery pubescent above; spines dark except on the fore tarsi where they are light; claws reddish tipped. All the legs somewhat sericeous.

There is a male in the British Museum collection marked as being this species, from Volcan di Chiriqui, but bearing no label by Cameron who says nothing about a male, so may not have seen it.

Sphex picipes Cameron.

Cameron's description of *picipes* is as follows:

(Page 11.) "14. Ammophila picipes (Tab. II, fig. ♂.).

"Nigra, flagello antennarum tegulisque sordide rufis; pedibus piceis basi nigris; abdomine rufo; basi late nigro; alis hyaliinis, apice fumatis. ♂.

Long. 15 millim. Hab. Mexico, Temax in North Yucatan (Gaumer).

Head and thorax covered with long cinereous or fuscous hair; apex of the clypeus sinuated, hardly depressed; mandibles piceous toward the apex. Front moderately depressed in the center. Third antennal joint one quarter longer than the fourth. Prothorax shining, impunctuate, elongate, the sides with a curved horizontal furrow; mesothorax rugosely

punctured, the mesonotum transversely so. Scutellum longitudinally striolated. Postscutellum and metathorax rugose. Petiole longer than the head and thorax united; red, black above; the second segment for the greater part red. The second and third cubital cellules variable; above subequal."

The types listed here as the property of Dr. Bequaert, he informs me, will be deposited at the Museum of Comparative Zoology, Cambridge, Mass.

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Valid names and those of uncertain standing are in Roman type, synonyms in italics.

EXPLANATION OF PLATES

Figures prepared from camera drawings; figures 1 and 2 slightly diagrammatic.

PLATE I.

Fig. 1. Side view of the thorax and propodeum of a *Phex*.

c, collar.
eps, short episternal suture.
fc, fore coxa.
g, gutter.
lid, lateral indented line.
lm, levator muscle.
mc, mesocoxa.
mms, meso-metaplural suture.
msk, mesocoxal knob.
msn, mesonotum.
msp, mesopluron.
mtk, metacoxal knob.
mtp, metapluron.
n, neck.
pc, hind coxa.
pet, petiole.
pl, prothoracic lobe.
pms, propodeo-metaplural suture.
ppl, propluron.
prd, propodeal disk.
pre, propodeal end.
prs, propodeal side.
psc, postscutellum.
r, rectangle of mesopluron.
s, suture between pronotum & propluron.
saa, subalar area.
sc, scutellum.
sp, spiracle.
teg, tegula.
tr, metaplural triangle.

Fig. 2. Side view of petiole and abdomen of a female *Phex*.

abd, abdomen.
pet, petiole.
sp, spiracle.
st, sting.

1, 2, first and second petiole segments.
1, 2, 3, 4, 5, first to fifth abdominal segments numbered above and below.

Figs. 3-7. Clypeal outlines of different species of *Phex* males.

Fig. 3. *Sphex aberti;* e, eye.
Fig. 4. *Sphex harti.*
Fig. 5. *Sphex dubius.*
Fig. 6. *Sphex fragilis.*
Fig. 7. *Sphex guerinii placidus.* SEE ERRATA
Fig. 8. Quadrangular head of *Sphex gaumeri* as seen from above.
Fig. 9. Hour-glass shaped head of *Sphex guerinii guerinii* as seen from above.

Plate II.

Fig. 10. Usual outline of clypeal margin in *Sphex* females. The shading marks the lower limit of the pubescence.
Fig. 11. Clypeal margin of *Sphex chiriquensis* female. Shading as in Fig. 10.
Fig. 12. Clypeal margin of *Sphex craspidotus* female. Shading as in Fig. 10.
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Fig. 17. *Sphex parapolitus.*
F.g. 18. *Sphex transversus.*
Fig. 19. *Sphex peckhami.*
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Fig. 23. *Sphex parapolitus* female. Transverse ridges shown only at the top.

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Fig. 25. *Sphex aberti.*
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Fig. 27. *Sphex dubius* male.
Fig. 28. *Sphex consors* male.
Fig. 29. *Sphex trichiosomus* male.
Fig. 30. *Sphex novitus* male.
Fig. 31. *Sphex floridensis* female.
Fig. 32. *Sphex floridensis* male.
Fig. 33. *Sphex novitus* female.
Fig. 34. *Sphex urnarius* female.
Fig. 35. *Sphex peckhami* male.
Fig. 36. *Sphex volcanicus* female.
Fig. 37. *Sphex willistoni* female.
Fig. 38. *Sphex transversus* male.
Fig. 39. *Sphex acutus* male.
Fig. 40. *Sphex aureonotatus.* Front view of collar showing its three lobes above: n, front margin of the neck where it joins the head.

Fig. 10.

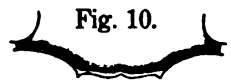


Fig. 11.

Fig. 12.

Fig. 15.

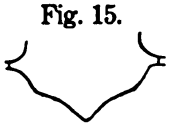


Fig. 16.

Fig. 17.

Fig. 18.

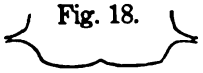


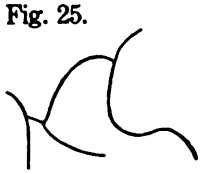
Fig. 19.

Fig. 13.

Fig. 14.

Fig. 24.

Fig. 25.



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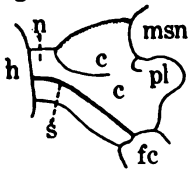

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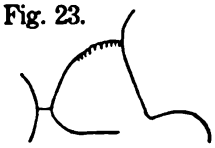

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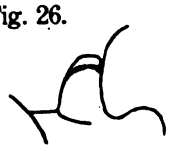

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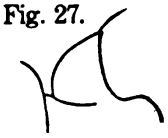

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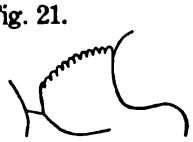

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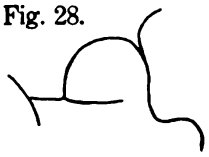

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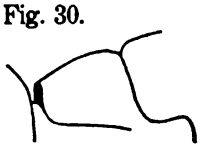
Fig. 30.



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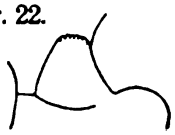

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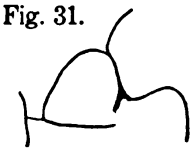

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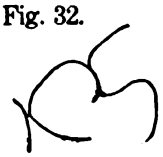

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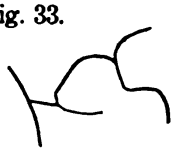

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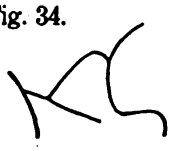
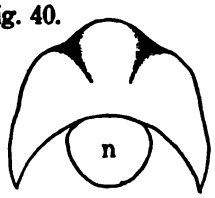


Fig. 35.

Fig. 36.

Fig. 40.



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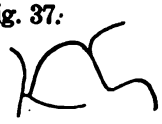

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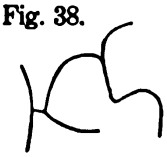

Fig. 39.