NOTES ON CERTAIN BOMBIDAE.

by

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A thesis submitted to the Department of Entomology and the Faculty of the Graduate School in partial fulfillment of the requirements for the Master's degree.

May 15, 1916. Approved: 

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Introduction.

The Bombidae, which are commonly called bumblebees, belong to the order Hymenoptera. The following paper contains the results of the study of the specimens of this family which were collected by the Kansas University Entomological Expeditions in Montana, Colorado, Wyoming, and Kansas during the past three summers, 1913-16.

Twenty-five species of Bombidae are discussed under the heads of two genera, Bombus and Psithyrus. This paper is largely taxonomic in nature, though an account of the life-history of the bumblebee is included, and reports the determinations, the study of the variations and freakish forms, and habitat records of each species collected, making special notation of a number of new habitat records not previously recorded. Some biologic notes based on a large nest of Bombus edwardsii Cress., taken in Colorado the summer of 1914, are included under the discussion of that species. Two new color variants of this same species are described. The original descriptions of the most variable species and of those most closely allied to each other are given in their proper place under the discussion of such species. The tables of genera were copied directly from Henry J. Franklin's "Bombidae of the New World", and the keys for classification of species were modeled
after those given by him. The glossary of terms as used in this paper and bibliography of literature accessible to the author are appended.

The author wishes to thank Prof. S. J. Hunter, under whose direction the work was done, for his many helpful suggestions. He also wishes to express his sincere appreciation for assistance rendered by the other members of the Entomological Department of the University of Kansas; especially to Professor H. B. Hungerford and Miss Ruby C. Hosford for many helpful criticisms and corrections of the paper, and to Mr. R. H. Beamer for photographing of plates. Many thanks are also extended to Professor Henry J. Franklin of the Massachusetts Agricultural College, at Amherst, Mass., for aid in verifying determinations and for the loan of literature; to Prof. George A. Dean of the Kansas State Agricultural College at Manhattan, Kansas, for the loan of a few specimens; and to Dr. Heinrich Friese of Mecklenburg, Germany, for literature that he generously contributed.
The species of the genus Bombus comprise one of the most important groups of pollinectors of which we know today. The red clover, *Trifolium pratense*, relies mainly upon these bumblebees for the transference of its pollen because they alone are enabled, by their longer tongues, to reach the nectar at the bottom of the long flower cups. It is because of the economic importance of these bees that the writer includes the life-history of the common bumblebee here. The bumblebee is an important factor in the pollination of many plants besides the red clover.

Long before the taxonomic study of this group was undertaken, the writer had gained through personal contact some knowledge of the Kansas species, most probably *B. pennsylvanicus* DeGeer or *B. fraternus* (F. Sm.), when he, perchance, disturbed a nest while plowing for wheat or haying in the meadow. Most of the stages in the life-history have been observed at some time or another in the fields.

The genus Bombus is classed with the social Hymenoptera which have queens, workers, and males all working and living together in one nest. The life-history of
these bees is mostly a story of the queen's activities for it is she upon whom most of the responsibility rests. The queen is the only form that lives through the winter. She hibernates in the ground or under rubbish or trash. Generally a north bank is chosen so that the temperature is more constant. In the spring when the weather warms up sufficiently, the queen is aroused from her torpor and immediately sets out in search of food. If the favorable weather continues the queen sets to work in search of a place to have a nest in which to establish her colony. If the temperature becomes cold, she will again seek a hiding place where she will relapse into semi-torpor in which state she remains until favorable weather causes her to become active again.

The nest is usually the deserted nest of a field mouse or it may be found in a bunch of finely woven together moss, grass, or leaves. It may be found on the surface of the ground but is generally beneath it. The queen works faithfully in arranging her material for the nest, taking great care to keep it very dry. She also takes great pains, when leaving the nest the first few times, to be able to locate it again. She accustoms herself to the appearance of the entrance by crawling around
it and finally she takes wing, rises slowly, and describes a series of circles each one larger and swifter than the last. She soon returns and without much difficulty is able to find the entrance to the nest.

The eggs are laid soon after the nest is completed. About a dozen eggs are deposited upon a lump of pollen, which is about the size of a pea, in the center of the nest. They are sealed over with wax as soon as they have been laid and are about one-eighth inch in length, white, and are thicker at one end than the other. The queen sits on the eggs to keep them warm and only leaves them in order to collect food when necessary. She constructs a waxen honey-pot in which to store food to be used in case of bad weather when food could not be obtained readily and her presence in the nest is most needed to keep the eggs warm. The eggs hatch in about four days and the maggot-like larvae are hairless, legless, and have a curled shape until they are about to pupate. At first they are yellowish white, but later they change to white with a grey-pink tinge which is imparted by the internal contents. The larvae are kept covered with wax the same as the eggs. They eat the pollen which has been provided for them and also fresh pollen which the queen provides as well as a
liquid mixture of honey and pollen. This is injected through the wax covering by the queen. While the larvae are small, they are fed collectively but as soon as they become large they are fed separately. Wax is added to keep them covered as they become larger. They become full grown in seven days and each one spins an oval cocoon around itself. The queen now removes most of the wax covering from the pale yellow cocoons. (See Fig. 1.) About eleven or twelve days are spent in the pupal stage, under most favorable conditions, and then the perfect worker bees bite a hole through the top of their respective cocoons and emerge. The worker is at first weak but manages to get over to the honey cup and secure some of the drink which refreshes and strengthens her. After about forty-eight hours she is mature enough to leave the nest and gather her first load of pollen and nectar.

More eggs are laid by the queen when the larvae are spinning their cocoons so that when the first workers emerge they are most needed to help care for the larvae which are generally approaching the most rapid period of their growth and require much attention and food. Eggs are laid by the queen at intervals of two or three days for four or five weeks. As soon as the colony is able to
maintain itself, the queen devotes her attention entirely to the indoor duties, laying eggs and feeding and incubating the brood. The workers do not continue to use the honey-pot constructed by the queen, but store the honey they gather into the cocoons they have vacated often adding wax to the rims of these if necessary to increase their capacity. The life of the worker bee lasts about four weeks ordinarily and is a very busy one. The adult worker spends most of the time journeying to and from the flowers, and she seldom returns home without having her abdomen distended with honey, and the tibia of each of her hind legs bearing a large pellet of pollen. (See Fig. 2.). In order to maintain proper ventilation in the underground nests it is often necessary for some of the workers to keep up a continual fanning with the wings.

After 200 to 400 eggs have been laid that will develop into workers, the queen begins to lay others that will produce males and queens, the earlier ones producing males chiefly and the later ones only queens. The queen larvae require more time to attain their full size than either the worker or the male larvae. When the young males are able to leave the nest, they soon leave free-foot and never return again for food or shelter. Their life
is rather idle and does not last more than three or four weeks. The young queens return to the nest occasionally, after being able to leave it, and sometimes they carry in some pollen on their legs. They soon leave the nest permanently and after mating they seek winter quarters. The old queen gradually loses her pile and her prolificness fails rapidly. If she is unable to lay enough eggs to keep the workers busy some of the latter lay eggs which, however, produce males only. When the young queens have emerged, the number of workers diminishes rapidly. Flowers grow scarce and the workers grow listless and become idle. In a few weeks the store of honey is consumed, the comb grows mouldy, and the queen dies, and thus death overtakes the community which was once so busy and prosperous.

The genus Psithyrus is often called the usurper-bee because they invariably make use of the nests of other bees. Each species has a certain species of Bombus in whose nest it feeds and breeds. They never carry pollen or nectar to the nest of the Bombus. Much strategy is required on the part of Psithyrus to be able to enter the nest of Bombus and not encounter too fierce a protest. Psithyrus is careful not to lay her eggs too soon after
entering the nest of Bombus. The life-history of Psithyrus is much the same as Bombus except that no workers are produced. The queens leave their winter quarters later than the Bombus queens. The eggs are laid in the nest of Bombus and are cared for by the workers of this species the same as they do those of their own species. Nests of Bombus which contain Psithyrus are greatly weakened and often the queen and many workers are killed in the struggle with the queen of Psithyrus which, by virtue of her thick strong chitinous covering, is almost invulnerable to the sting of the species of Bombus.
Systematic Position and Distribution.

The family, Bombidae, which is really a subfamily of the Apidae, belongs to the order Hymenoptera. It is separated from the other larger families by the following characteristics: unsegmented trochanters; female provided with a sting; basal part of the abdomen without a knot; first segment of the posterior tarsi enlarged, flattened and more or less clothed with hair; plumose hairs on the thorax; glossa not flattened, but slender and longer than the mentum; basal segments of the labial palpi elongate; (For explanation of wing parts, see Figures 3-6). anterior wing with three closed submarginal cells; tip of marginal cell remote from the base; first recurrent nervure received by the second submarginal cell near its middle; first discoidal cell not as long as or scarcely longer than, the marginal cell; stigma not well developed; second submarginal cell rather longer than the first or third; marginal cell long, pointed at the tip, extending far beyond the apex of the third submarginal cell; second submarginal cell strongly produced at the base beneath; posterior tibia with apical spurs, see Fig. 7.

The Bombidae are very widely distributed over the world. Some species of Bombus has been recorded from
every land area of the globe except Australia and some of the islands near that country. There are habitat records reported for altitudes ranging from sea level up to 15,000 feet above sea level, in some parts of Russia. The size and abundance of the family, Bombidae, in North America have caused it to receive much attention and study from entomologists. For this reason, many new species will probably not be found in the United States; however, there is much of interest to learn about new habitat records and about new variations within the various species. The species which have the greater part of their habitat in the western states show the most variations in the coloration of their pile. Greatly variable forms are usually found in widely separated regions but most of the variable species show, to a certain extent, the same variation in all parts of their habitat. Sometimes specimens from the same nest and belonging to the same sex, show great variation in the coloration of the pile. High altitudes, rather than high latitudes, seem to have the stronger influence in bringing out the lighter colors. Specimens from the mountains and the colder climate have longer and finer pile than those from the warmer climatic regions.
Characters of Bombidae.

The bees of this family may be described as being for the most part large and having oblong-shaped bodies which are rather thickly covered with pilose hairs of various colors. The head is triangular in shape. There are three ocelli on the vertex with the center one slightly below the others. The malar space is large except in some males where it is merely a transverse line. The clypeus is not carinate. They are long-tongued bees. Four segments are found in the labial palpi and two segments in the maxillary palpi. The labrum is transverse and the mandibles of the female are stout and grooved on the outside toward the apex; those of the male are two-toothed and heavily covered with hairs on their exterior lower sides. The antennae are longer than the head and are geniculated and filiform, see Figures 8&9. The wings are large, especially the front wings, see Figures 3-6. The first cubital cell is divided by an oblique nervure; the second cubital cell is much narrowed toward the marginal cell and receives the first recurrent nervure about the middle; the third cubital cell is narrowed toward the marginal and receives the second recurrent nervure near its apex. The scutellum does not project strongly over
the median segment. The hind tibia has two apical spurs, and the hind metatarsi of the females are always much dilated and form the corbicularia. The claws are bifid, see Fig. 10. The abdomen is always robust in form, truncate at the base and pointed at the apex in the females and rounded at the apex in the males. It is always convex on the dorsal side. The females are always provided with a sting. The males always have seven segments in the abdomen, the females having but six. Males always have eleven joints in the flagellum of the antennae while the females have but ten. The following tables of genera were copied literally from "The Bombidae of the New World", by H. J. Franklin.

Tables of Genera.

FEMALES.

Hind tibia convex and well covered with hair without; each side of the apical portion of the hypopygium with a noticeable elevation or carina................Psithyrus.

Hind tibia flat or concave and, for the most part, bare on their outer sides, their fore and hind borders fringed with long hairs forming pollen baskets; apical ventral abdominal segment without lateral elevations.

Bombus.
Volsella and squama of genitalia membranous; face always densely covered with black pile with which there is usually no admixture of yellow hairs; outer surface of hind tibia, in most species, well covered with pile throughout..........................Psithyrus.

Volsella and squama of genitalia corneus, a good share of the species with face bearing a noticeable amount of yellow pile; outer surface of hind tibia in most places more or less bare..........................Bombus.

In addition to what is given in the table above, the following points may add in distinguishing Bombus from Psithyrus: females of Bombus have wings more hyaline; have thick furry pile; often have plain bands of colored hair; and are usually more lively in flight throughout their life time. Females of Psithyrus have dark brown wings; are thinly haired with no bands; begin their flight later than Bombus and fly close to the ground as if in search of a nest of Bombus.

The males of Bombus have bright yellow striped abdomens; small heads, mostly longer than broad; and the wings hyaline. Males of Psithyrus have no bright bands of pile on the abdomen; large heads, often shorter than broad; and the wings are brownish.
Key for the Classification of Bombus Which Are Discussed in This Paper.

FEMALES.

1. Face with a considerable amount of light or yellow pile.............................................. 2.
   Face with very little or no light or yellow pile...16.

2. Pleura, or at least their lower parts, covered with dark pile or so shaded by the admixture of dark hairs as to be noticeably darker than the front part of the thorax above; yellow pile not reaching the bases of the legs.........................3.
   Pleura covered with yellow pile to bases of legs....7.

3. Abdomen with more or less ferruginous-red pile on some of the dorsal abdominal segments........4.
   Abdomen with no ferruginous pile above.............5.

4. Fringes of corbicularæ with a distinctly ferruginous tinge; black interalar band extending back on to the scutellum in a sharp V.............edwardsii.
   Fringes of corbicularæ without a ferruginous tinge; black interalar band usually not very distinctly marked; never extending into a sharp V on to the scutellum..................rufocinctus.

5. Clypeus completely impunctate, smooth and shining
except the corners; last abdominal segment black above..............................appositus.

Clypeus somewhat sparsely punctured over its entire surface..............................6.

6. First abdominal segment covered above chiefly with black pile..........................occidentalis.

First abdominal segment covered above chiefly with light or yellow pile.................edwardsii.

7. Third and fourth dorsal abdominal segments entirely covered with black pile..................a'.

Third and fourth dorsal abdominal segments not both entirely covered with black pile...............8.

a' Fifth dorsal abdominal segment black above; yellow pile on scutellum and on anterior part of thorax above with black hairs strongly intermixed.flavifrons.

8. First four segments of abdomen above all covered with yellow or tawny pile..................9.

Not all the first four abdominal segments above covered with tawny or yellow pile...............10.

9. Last two abdominal segments black; clypeus more or less punctate..........................centralis.

Only the apical abdominal segment black; clypeus smooth and shining......................appositus.
10. Pile over the greater part of the thoracic dorsum of black and yellow hairs mixed, giving a clouded appearance.................................11.
This pile not appearing clouded; black interalar band rather distinct.................................13.

11. Pile on the scutellum conspicuously lighter than that on any other part of the dorsum of the thorax.

   *melanopygus.*

Pile on scutellum not conspicuously lighter than on any other part of the dorsum of the thorax.....12.

12. The apical segments of abdomen covered above with light or ferruginous pile, or at least with such pile very strongly intermixed......................0'.
The apical segments of abdomen above not covered above with light or ferruginous pile......*flavifrons.*

0' Length of malar space about the same as the breadth at the apex..............................*mixtus.*

13. Second dorsal abdominal segment entirely covered with yellow pile..............................*centralis.*
Second dorsal abdominal segment not entirely covered with yellow pile..............................14.

14. Yellow pile on the face not very noticeable, sometimes entirely absent......................*rufocinctus.*
Yellow pile on the face very noticeable...........15.

15. Fringes of corbiculae usually with a distinct ferruginous tinge; black interalar band extended posteriorly in the middle so as to divide or nearly divide the yellow of the scutellum.........edwardsii.

Fringes of corbiculae usually black and without a ferruginous tinge; posterior border of black interalar band running straight or nearly so across the thorax; second and third dorsal abdominal segments covered with ferruginous-red or yellow pile...huntii.

16. Pleura or at least their lower parts, covered with black pile or so shaded by the admixture of dark hairs as to be noticeable darker than the front part of the thorax above; yellow pile not reaching the bases of the legs.........................17.

Pleura covered with yellow pile to bases of legs..18.

17. Dorsum of thorax entirely covered with yellow pile except, perhaps, a small dark spot in the center; no black interalar band.........................19.

Scutellum covered with black pile or else a black interalar band is present.........................21.

18. Not more than two dorsal abdominal segments covered to any extent with other than black pile............20.

More than two dorsal abdominal segments covered entirely
-22-

entirely or for the most part with other than black pile.............................................26.

19. First four segments entirely covered above with yellow pile..................*fervidus*.var. *dorsalis*. Not all of these segments covered above with yellow pile; more than two dorsal abdominal segments covered with yellow pile; malar space longer than its width at the apex; ocelli placed well below the supra-orbital line in the narrowest part of the front.....................*nevadensis*.

20. No black interalar band present; malar space not twice as wide at its apex as it is long.............b'.
Black interalar band present; malar space twice as wide at its apex as long.....................b''.

b' No touch of yellow pile on lateral margins of third segment..............................*separatus*.

b'' Ocelli large, well below the supra-orbital line, in the narrowest part of the front; the lateral ones nearer to the margins of the eyes than to each other. *fraternus*.

21. Apical abdominal segments without white pile above.22.
Apical abdominal segments with white pile above; fringes of corbiculae with a distinct ferruginous tinge..........................*occidentalis*. 
22. Fourth and fifth abdominal segments both almost or entirely covered above with black pile.............23. Fourth and fifth abdominal segments not both nearly covered with black pile.........................24.

23. Ocelli large, well below the supra-orbital line in the narrowest part of the front. Third dorsal abdominal segment entirely covered with yellow pile. 

(As in Fig. 18)  

_auricomus_.

Ocelli small, near the supra-orbital line. Scutellum usually dark, with very little or no yellow pile. 

(See Fig. 19.)  

_pennsylvanicus_.

24. Apical abdominal segments without ferruginous-red pile above; all the first four abdominal segments covered with yellow pile above............._fervidus_. Not all the first four abdominal segments so covered.25.

25. Lalar space much longer than it is wide at its apex.  

_californicus_.

Lalar space not much longer than it is wide at its apex...................._occidentalis var. nigroscutatus_.

26. First four dorsal abdominal segments covered entirely with yellow pile; the apical segments without ferruginous pile.........................27. Not all the first four dorsal abdominal segments are
covered with yellow pile........................................c'

27. Black interalar band present..........................fervidus.
   No black interalar band present.fervidus var. dorsalis.
c' Black interalar band more or less distinct; occiput
   bearing little or no yellow pile; malar space fully
   one-third the length of the eye; third dorsal abdomi-
   nal segment entirely covered with black pile, but
   sometimes a little black pile near the lateral
   margins.....(Sec. Fig. 12)..................................kirbyellus.

MALES.

1. Eyes much swollen, bulging out from the sides of the
   head; ocelli placed well below the supra-orbital line;
   malar space short...........................................2.
   Eyes not bulging noticeably; ocelli near the supra-
   orbital line..................................................9.

2. More than two dorsal abdominal segments covered with
   yellow pile..................................................3.
   Not more than two of the abdominal segments thus
   covered......................................................4.

3. Third antennal segment as long as segments four and
   five together..............................................5.
   Third antennal segment equalling segment five..
   rufocinctus.
4. Lalar space a mere transverse line............fraternus. (See Fig. 11).
   Lalar space one-third as long as wide.............6.

5. Apical segments of abdomen with dull ferruginous yellow pile..................nevadensis.
   Apical segments of abdomen with black pile..auricomus.

6. All the dorsal abdominal segments beyond the second entirely covered with black pile.............7.
   Not all the segments so covered.....................8.

7. Second dorsal abdominal segment with no black pile.d'
   The second dorsal abdominal segment partly covered with black pile..................separatus.

8. Third antennal segment as long as segments four and five together..................auricomus.
   Third antennal segment equalling segment five. rufocinctus.

9. Hairs fringeing hind tibia on the outer surface with a more or less distinctly light or ferruginous tinge.10.
   Hairs fringeing hind tibia on the outer surface almost entirely black................20.

10. Hind femora with little or no light or yellow pile.11.
    Hind femora with considerable light or yellow pile.13.
11. Second dorsal abdominal segment entirely covered with yellow pile; apical abdominal segments with no white pile. \textit{californicus}. Second dorsal abdominal segments seldom entirely covered with yellow pile. 12.

12. Apical abdominal segments usually covered with white pile, without a distinct ferruginous tinge; third dorsal abdominal segment usually not entirely covered with yellow pile. \textit{occidentalis}. Light pile on apical abdominal segments usually with a distinct ferruginous tinge; third dorsal abdominal segment entirely covered with yellow pile. \textit{occidentalis var. nigroscutatus}.

13. Malar space fully one-half as long as the eye. (See Fig. 12). \textit{kirbyellus}.

14. Pleura black or strongly shaded by an admixture of dark hairs which usually predominate. \textit{kirbyellus}.

15. First two dorsal abdominal segments entirely covered with yellow pile; apical segments with rather long
loose pile..........................pennsylvanicus.
First two dorsal abdominal segments not both entirely covered with yellow pile; pile of apical segments rather short and dense..........................12.

Second abdominal segment wholly or partly covered with black or ferruginous pile..................24.

17. Third and fourth abdominal segments entirely covered on the dorsum with ferruginous-red pile.

flavifrons and centralis.
Third and fourth dorsal abdominal segments not both entirely covered with ferruginous-red pile.......18.

18. Third dorsal abdominal segment entirely covered with yellow pile; black interalar band distinct; posterior border of hind metatarsi fringed with short hairs or bristles..................pennsylvanicus.
Third abdominal segment not entirely covered with yellow pile..........................19.

19. Black interalar band more or less distinct; yellow spot on the face, when present, not nearly reaching the margin of the eye on either side....californicus.
Black interalar band not at all distinct, the middle
of the dorsum of the thorax having only a clouded appearance due to the thorough mixture of yellow and black pile; yellow pile on the face very nearly reaching the inner margin of the eye on each side. *mixtus*.

20. Occiput with very little or no light or yellow pile. 21. Occiput with considerable light or yellow pile. 22. Occiput with very little or no light or yellow pile.

21. Apex of abdomen usually bearing a considerable amount of dull ferruginous-red pile; some of the tibia usually more or less distinctly fringed with ferruginous hairs; pile of scutellum often but not always, with a very strong admixture of black hairs.

*pennsylvanicus*.

Apex of abdomen always black; all of the tibia black, except the posterior ones on the inner side; pile of scutellum never with a strong admixture of black hairs. *fervidus*.


Second dorsal abdominal segment covered with ferruginous-red pile. *melanopygus*.

24. Black interalar band present. 25.
Black interalar band absent..........................29.

25. Black interalar band extended into a distinct V
on the middle of the scutellum.........................26.

Posterior margin of interalar band straight or nearly so.27.

26. Yellow pile on face and on anterior portion of thorax above strongly mixed with black hairs.

**melanopygus.**

Yellow pile on these regions with few or no black hairs intermixed...............................**edwardsii.**

27. Abdomen with some segments bearing ferruginous-red pile.............................................30.

Abdomen with no segment bearing ferruginous-red pile.28.

28. Apical abdominal segments bearing white or whitish ferruginous pile..............................**occidentalis.**

Apical abdominal segments not bearing white or ferruginous pile.....................................**californicus.**

29. First dorsal abdominal segment covered with black pile for the most part........................**occidentalis.**

First dorsal segment entirely covered with yellow pile.................................................**melanopygus.**

30. Front part of dorsum of thorax clouded by a mixture of yellow and black hair...................**melanopygus.**

Dorsum of thorax not so clouded in front........**huntii.**
Key for the Classification of Psithyrus Discussed in This Paper.

**FEMALES.**

1. Occiput black, with little or no light or yellow pile; pleura bearing light or yellow pile to bases of legs. *latitarsus.*

   Occiput bearing a considerable amount of yellow pile; pleura with lower portion dark brown or black........2.

2. Abdomen with no segment bearing yellow pile. *variabilis.*

   Abdomen with considerable yellow pile on some segments..........................*insularis.*

**MALES.**

1. Pleura covered with yellow pile to bases of legs....2.

   Lower portion of pleura covered with dark brown or black pile.................................3.

2. Third and fifth antennal segments subequal in length...........................................*suckleyi.*

   Fifth antennal segment nearly equalling the length of the third and fourth together...............*consultus.*

3. Scutellum bearing much yellow pile............*variabilis.*
DISCUSSION OF SPECIES.

Bombus occidentalis Greene.

The subspecies, nigroscutatus, is very closely allied to occidentalis so that I am including the descriptions and discussions of the two species together. This species has been found in Alaska, British Columbia, Colorado, Wyoming, Montana, California, Washington, Oregon, Utah, New Mexico, and Nebraska. These species are not closely allied to any others which are taken up in this paper. Both of them were new to The Snow Entomological Collections.

B. occidentalis is one of the most variable species mentioned in this paper. The various extremes are given in the original description and the color variants of the two subspecies are also given. Among the specimens which I have, there are thirty-five occidentalis from Beaver Creek, Montana, and eighty of the same species from Creede, Colorado. I also have twenty-six specimens of nigroscutatus, all from Creede, Colo. Many of the various color variants are represented among the specimens which I have.

B. occidentalis is often hard to distinguish from nigroscutatus but as a rule the latter species has more strongly ferruginous pile on the apical abdominal segments.
Bombus occidentalis Greene. (Original description).

Pile of medium length and texture. Face with more or less yellow pile; occiput black in females, yellow in males; thorax variable but the anterior part of dorsum always covered with yellow pile; abdomen variable but always black at the base and white or whitish ferruginous at the apex, black or yellow in the middle; wings rather light; legs dark, but the corbicular fringes more or less ferruginous.

Queen. Head.-- Face bearing a somewhat variable mixture of black and yellowish ferruginous pile; occiput and cheeks dark. Labrum with tubercle-like areas large and moderately well separated, their summits rather deeply concaved and their margins rather sharply elevated; the space between these areas and above the shelf-like projection prominent and moderately wide. Malar space shorter than its width at the apex; not more than one-fifth as long as the eye. Clypeus moderately punctate. Flagellum of antennae about one and three-fourths times as long as the scape; third antennal segment much longer than the fifth, the fifth somewhat longer than the fourth.
Thorax.— Anterior part of dorsum covered with yellow pile, the yellow usually extending down on to the mesopleura somewhat below the level of the bases of the wings; the remaining portion of the dorsum sometimes entirely black, sometimes with only a mixture of yellow hairs with the black on the scutellum, sometimes with the scutellum entirely yellow and a black band between the bases of the wings, and sometimes even this band replaced by yellow pile, leaving only the disc dark; the disc naked, smooth and shining; mesopleura, except their very upper parts, covered with black pile to the bases of the legs; metapleura and sides of median segment entirely dark.

Abdomen.— Dorsum; segments one, two, and three entirely dark; segment four entirely black or black with a fringe of white hairs on its apical margin; segment five covered with white or whitish pile; segment six either entirely whitish or mostly black with white or whitish hairs on the sides. Venter mostly black, but the apical margins of the apical segments fringed more or less with whitish hairs.

Wings.— Moderately stained with brown; the fore pair variable, but usually lightest across the middle and darkest about the anterior apical portion of the radial cell.

Legs.— Mostly dark; the middle tibia sometimes with a noticeable amount of ferruginous pile on their hind sides.
especially toward their distal ends; corbicular fringes always more or less strongly ferruginous.

Worker. Much like the queen, but the wings usually somewhat lighter; the scutellum at most with only a slight admixture of yellow hairs with the black; face usually mostly dark, without a very noticeable amount of yellowish ferruginous pile, and often entirely dark.

Male. Head.-- Shaped much like that of females. Face bearing a large amount of yellowish pile, sometimes pure and sometimes mixed with black; mostly black above the bases of the antennae. Occiput sometimes with pure yellowish pile and sometimes with black hairs admixed. Ventro-lateral portions of head often with a noticeable amount of brownish yellow pile; the cheeks otherwise dark. Malar space longer than its width at the apex; about one-fifth as long as the eye. Clypeus usually mostly covered up with pile. Flagellum of antennae about two and one-half times as long as the scape; third and fifth antennal segments subequal in length, the fourth shorter than either.

Thorax. Coloration much as in queen and with about the same variation, but with the mesopleura often with the yellow pile extending down from the dorsum, in a rather narrow line, nearly to the bases of the legs and occasionally
entirely covered with yellow pile to the bases of the legs.

**Abdomen.** Dorsum: The first four segments entirely black; the last three entirely covered with white or whitish pile, often with a more or less strongly ferruginous tinge. Venter clothed much as in females, but usually with somewhat more light pile.

**Genitalia.** Outer spatha very short in comparison with its width; anterior angles widely rounded; anterior margin widely, deeply, and evenly incurved; posterior margin broadly and rather evenly outcurved except on the sides, where it appears to be more or less truncate; ventral surface, near posterior margin, bearing a tuft of rather long, loose hairs. Inner spatha variable; deeply bifid at the apex and with a large fenestra near the middle; often with two or three smaller fenestra toward the apex; apical margin pretty well covered with hair on the ventral surface or nearly hairless; ventral surface somewhat teticulate. Each clasper short, thick, and stubby; branch wide at the base but narrowing rapidly to an almost pointed apex as seen from either above or below. Volsella considerably hidden, except toward the apex, within the branch; considerably wider at the base than toward the apex, apex appearing very hairy and obliquely truncate and with a rather narrow recurved
apical projection. Squama almost divided by a deep notch on the side. Sagitta wide and flaring, with twisted shaft; head bluntly pointed at apex and with wide base, the margins being irregularly serrate.

Wings. About as in worker; subhyaline.

Legs. Sometimes with little or no light pile, but the coxae and trochanters usually, and the bases of the femora often, with considerable yellowish or brownish yellow pile on their lower sides and sometimes the femora largely clothed with light pile even to their tips; the hind sides of the middle tibia usually and often also the anterior tibia bearing a considerable amount of ferruginous pile; outer faces of hind tibia slightly convex, naked, smooth, and shining; the corbicular fringes usually strongly ferruginous; posterior metatarsi without long hind fringes.

Dimensions. -- Length; queen, 15 mm. to 18 mm.; worker, 9½ mm. to 15 mm.; male, 11½ mm. to 15½ mm. Spread of wings; queen, 37½ mm. to 39 mm.; worker, 23 mm. to 34 mm.; male, 28 mm. to 34 mm. Width of abdomen at second segment: queen, 9 mm. to 10 mm.; worker, 5½ mm. to 8½ mm.; male, 6½ mm. to 7 mm.

Color Variant 1. -- Queen and worker like the typical form, but with the fourth dorsal abdominal segment largely,
and sometimes entirely, covered with white pile.

**Color Variant 2.**—Queen and worker like Color Variant 1, but with more or less yellow pile on the third dorsal abdominal segment and with the scutellum usually strongly yellow.

**Color Variant 3.**—Queen and worker like Color Variant 2, but with the fourth dorsal abdominal segment entirely black; scutellum black.

**Color Variant 4.**—Queen and worker like Color Variant 3, but with the apical margin of the fourth dorsal abdominal segment usually fringed with white pile, the whole of the third segment and often an apical fringe on the second, of yellow pile and the scutellum more or less yellow.

**Color Variant 5.**—Queen and worker like Color Variant 4, but with the extreme sides as well as the apical margin of the second dorsal abdominal segment bearing yellow pile.

**Color Variant 6.**—Like Color Variant 4, but with the fourth dorsal abdominal segment entirely covered with white pile.

**Color Variant 7.**—Queen like Color Variant 6, but with the apical margin of the second dorsal abdominal segment bearing yellow pile and sides of the segment also with a large amount of pile of the same color; the scutellum
entirely covered with yellow pile and the black interalar band with considerable yellow pile admixed.

**Color Variant 8.**— Worker like that of typical form, but with the abdomen entirely black.

**Color Variant 9.**— Worker like that of Color Variant 4, but with the second dorsal abdominal segment, except the very basal middle, entirely covered with yellow pile; mesopleura entirely covered with yellow pile to the bases of the legs.

**Male Color Variant 1.**— Like the typical male described above, but with the special portion of the fourth dorsal abdominal segment bearing white pile; some touches of yellow hair often present about the bases of the legs.

**Male Color Variant 2.**— Like Male Color Variant 1, but with the fourth dorsal abdominal segment entirely covered with white pile and with touches of yellow pile on the sides of the second dorsal segment.

**Male Color Variant 3.**— Like Male Color Variant 1, but with touches of yellow on the sides of the second dorsal abdominal segment.

**Male Color Variant 4.**— Like the typical form, but with touches of yellow pile on the sides of the second dorsal abdominal segment.
Male Color Variant 5. — Like the typical form, but with more or less yellow pile on the third dorsal abdominal segment.

Male Color Variant 6. — Like Color Variant 5, but with the fourth dorsal abdominal segment entirely covered with white pile.

Male Color Variant 7. — Like Male Color Variant 5, but with the third dorsal abdominal segment entirely covered with yellow pile and the apical margin of the second segment bearing pile of the same color.

Male Color Variant 8. — Like Male Color Variant 7, but with the sides of the second dorsal abdominal segment bearing yellowish pile.

Male Color Variant 9. — Like Male Color Variant 8, but with both the second and third dorsal abdominal segments entirely covered with yellow pile.

Subspecies nigroscutatus. (Much like B. occidentalis).

Queen. Dorsum of abdomen with segment one black; segment with apical margin and sides yellow, the rest black; segment three entirely covered with yellow pile; segment four entirely black; segment five entirely covered with ferruginous-whitish pile; segment six either entirely black or with more or less ferrugino-whitish pile on the sides.
Scutellum at most with no very great amount of yellow pile and usually entirely black or nearly so.

Worker.— Like the queen in most respects, the yellow often of a whitish shade; the wings usually lighter than those of the queen; the sixth dorsal abdominal segment with ferrugino-whitish pile on the sides; the scutellum always entirely, or almost entirely, dark; the face darker than that of the queen, at most with no very noticeable amount of light pile.

Male. Much like Male Color Variant 8 of the subspecies *occidentalis*, but with the pile on the three apical dorsal abdominal segments more ferruginous in color.

Color Variant 1.— Queen like typical subspecies queen, but with the second dorsal abdominal segment at most bearing yellow pile only on its apical margin and sometimes entirely black; scutellum sometimes entirely yellow and even the black interalar band with an admixture of yellow hairs.

Color Variant 2.— Queen and worker like the typical subspecies queen and worker, but with the second dorsal abdominal segment, except the very basal middle, entirely covered with light yellow pile.

Male Color Variant 1.— Like the typical subspecies male, but with the second, as well as the third, dorsal abdominal segment nearly or entirely covered with yellow pile;
the femora often entirely covered with light pile to their tips.

Male Color Variant 2.— Like Male Color Variant 1, but with the first abdominal segment bearing some yellow hair; face and occiput bearing some dark pile but mostly light pile; ventro-lateral portions of the head with much yellow pile; thorax entirely covered with yellow, except for some dark pile in the middle between the bases of the wings and the dark metapleura and median segment; venter and femora largely clothed with light pile; the second dorsal abdominal segment entirely covered with yellow pile.

l. c. Franklin.
Bombus appositus Cresson.

Bombus appositus is not very closely related to any other species which I have studied. It has been reported from New Mexico, California, Colorado, Montana, Wyoming, Oregon, Utah, Washington, Nevada, and British Columbia. It is reported to be rather rare in Colorado and increasing in abundance northwards, reaching its maximum in western Montana. However, the collecting of the Kansas University Biological Survey Parties does not show this to be true, because out of one hundred fifteen specimens collected only five were from Montana and the remaining forms were from Creede, Colorado.

This is a beautiful species with the whitish pile covering the dorsum of the thorax, except for the broad black band between the bases of the wings. There are not many variations, however I found one male which is quite different from the others. This specimen is colored more darkly, especially the dorsum of the abdomen of which the first five segments, instead of being densely covered with yellow or tawny pile, have their apical margins and sides covered with yellowish-ferruginous pile and the remaining segments are dark. Segment six has yellow pile except in the center which is dark; the apical segment is black.
with a tuft of light pile at each side as the typical form is described.
Bembus kirbyellus Curtis.

This species was not found very extensively. I have only four females, three from Beaver Creek, Montana, and one from Creede, Colorado. It is new to the Snow Entomological Collections. It has been reported from New Mexico, Montana, Colorado, and Oregon. It is a strictly Boreal form and has been found in Siberia, Alaska, British Columbia, Alberta, Labrador, Boothia Felix, Hudson's Straits, and the Hudson Bay Territory.

It does not appear to be a very common species in any part of its habitat. It is a rather variable species but is not closely allied to any other taken up in this paper. The wings of the specimens, which I have, are all as described in the original description. The one specimen from Colo. has the coxae entirely black while the other three from Mont. have a more or less noticeable amount of light pile; trochanters of all have very little light pile on the lower side; fore and middle femora of two specimens have no light hair at their bases and the other two have a slight touch of light hair at their bases; hind femora of two having light pile at the base and two having the hind femora entirely dark,-- even at the base. The coloration of the tibia and corbicular fringes seems to be the same in all.
The specimen from Colorado has an entirely black face while the others have a slight tuft of light pile between the bases of the antennae; occiput entirely black in all and sides of head behind the eyes entirely dark. Translucent areas of labrum not very noticeable, almost absent. The malar space of this species (See Fig. 12) is much longer than for the average length of malar space in others and ranges from one-third to one-half as long as the eye.

Dorsum of the thorax is covered with whitish pile, except for a broad black interalar band, in three of the specimens. The one from Colorado has a more yellowish tinge to the coloration of its pile. There is some variation in the coloration of the metapleura and sides of median segment which are dark in one specimen, covered with a mixture of light and dark pile in two specimens, and covered with yellowish light pile in the specimen from Colorado.

The coloration of the abdomen affords still greater variations. The first two segments of dorsum of abdomen are covered with whitish pile though it much more conspicuous in some specimens than in others. Segment three is almost entirely black in the specimen from Colorado, but it has a touch of light pile on the extreme side margins
and a more or less strong fringe of the same color extending inward more or less to the middle along the apical margin. This segment in the three specimens from Mont. is entirely covered with light yellowish pile. Segment four entirely covered with light yellowish pile in the Mont. specimens and almost entirely black in the specimen from Colorado. Segments five and six in the Mont. specimens are much the same in all and are covered with a black rusty colored pile. In the other specimen, segment five is mostly yellow, especially at the apical end, with some dark hairs intermixed. Venter clothed lightly with light pile, the Colo. specimen having a much heavier covering than the other specimens. Any points not mentioned here are given in the original description which follows below.

_Bombus kirbyellus Curtis._ (Original description).

Pile very long and fine. Head of females black. Thorax entirely covered with light pile, except perhaps for the broad black interalar band; dorsum of abdomen yellow at the base, black in the middle and whitish or ferruginous at apex. Wings light. Malar space very long.

_Queen._ Head.-- Elongate in form. Face entirely black, except for occasionally a slight tuft of light pile between the bases of the antennae; occiput usually entirely
black, but sometimes with a very slight sprinkling of light hairs; sides of head behind the eyes entirely dark. Tubercle-like areas of labrum with summits not very deeply concaved and only very sparsely punctate and upper (posterior) margins rounded, the space between them, above the shelf-like projection rather small; translucent areas small and dim, almost absent. Malar space between one-third and one-half as long as the eye; clypeus sparsely punctate over disc, rather smooth and shining; flagellum of antennae about twice as long as scape; third antennal segment distinctly longer than the fifth, the fifth longer than the fourth.

**Thorax.**—Dorsum entirely covered with very light pile, yellow or whitish, except for the broad black interalar band; the yellow on the anterior part not quite reaching back to the tegulae in some specimens; anterior border of black band bending forward and posterior backward in the middle, its length along the middle line, from front to hind margin, distinctly more than half its width from wing base to wing base; scutellum bearing only light pile. Mesopleura entirely covered with light (whitish in most specimens) pile, both black under the bases of the wings and to the bases of the legs. Metapleura and sides of
median segment occasionally entirely dark, but usually with more or less light hair and often with light pile only. Colors of thorax as a whole sharply defined.

**Abdomen.**-- Dorsum: first two segments always entirely covered with pure whitish yellow pile; third segment mostly black, but always with a touch of light pile on the extreme side margins and often with a more or less strong fringe of the same color extending inward more or less toward the middle line along the apical margin; fourth segment very variable, often entirely covered with ferruginous or whitish yellow pile (of varying shade) and as often entirely black; fifth segment usually entirely covered with ferruginous or whitish yellow pile (of greatly varying shade), but sometimes with such a strong admixture of black hairs as to make this color greatly predominant; sixth segment always entirely black, except for rusty tip. Venter somewhat variable, but usually clothed (except first and last segments) for most part with light pile.

**Wings.**-- Subhyaline; the fore pair darkest on median and submedian cells and on anterior part of the radial cell and about and beyond its apex.

**Legs.**-- Coxae sometimes entirely black, but usually with a noticeable amount of light hair; trochanters seldom
without a considerable amount of light pile on the lower side; fore and middle femora often entirely dark, but usually with a slight touch of light pile at their bases; hind femora usually with a conspicuous amount of light hair at least on basal portion, rarely entirely dark; fore and middle tibia, except rusty outer sides of apices, entirely dark; corbicular fringes usually more or less strongly ferruginous, but often entirely dark.

**Worker.**—Like the queen but with the pile on the metapleura and sides of median segment never entirely dark, usually entirely light; posterior and middle coxae, trochanters and bases of femora never without some light hair; pile on dorsal abdominal segments four and five usually much more strongly ferruginous than in case of queen and also the venter with this ferruginous pile sometimes extending slightly onto the side margins of the corresponding segments.

**Male.** Head.—Shaped as in queen. Face with a large patch of yellow pile between and below the base of the antennae, this patch widely separated from the inner margins of the eyes on each side and sometimes with black hairs admixed; occiput bearing triangular patch of sometimes pure yellow pile, but usually with a very slight admixture
of black hairs; ventro-lateral portions of head usually with considerable yellow pile. Malar space about half as long as eye; clypeus mostly covered up with pile; flagellum of antennae about three times as long as the scape; fifth antennal segment nearly as long as third and fourth taken together, third segment longer than the fourth.

**Thorax.**—Colors arranged as in worker, but with interalar band much less sharply defined, there being a more or less strong admixture of yellow hairs with the black; metapleura and sides of median segment never with black hair.

**Abdomen.**—Coloration about like that of worker; third dorsal segment sometimes entirely black; fourth segment usually entirely black, except for some yellow hair on the extreme side margins, sometimes entirely black; apical dorsal segment often entirely black, but as often entirely covered with ferruginous (of greatly varying shade) or whitish yellow pile, as with segments five and six; fifth segment often partly or entirely black. Venter, except the sides of the first segment and the apical segment, rather heavily clothed with long, light yellow pile; apical segment usually more or less tinged with ferruginous, especially on the apical margin, sometimes black.

**Genitalia.**—Outer spatha with anterior lateral pro-
jections very long, slender and rounded at the end; main part a little less than one-third as long, from anterior to posterior border along the middle line, as wide, from side margin to side margin; anterior margin widely and rather evenly incurved; posterior margin broadly rounded on the sides, but rather widely and deeply incurved in the middle; ventral surface on each side of the apical portion bearing a scattered patch of long hairs. Inner spatha tridentate at apex. Claspers as described for group. Inner lobe of squamae vestigial. Shaft of sagittae with a predominant projection a little in front of the middle of the lower side.

Wings.-- Usually a trifle lighter than those of queen and worker.

Legs.-- Coxae, trochanters, and femora always with a large amount of yellow pile; fore and middle tibia often dark for the most part, but usually with a considerable amount of light or ferruginous pile on their outer and posterior sides and often within also; hind tibia with their outer faces bare and with fringes always more or less strongly ferruginous; posterior metatarsi with light or ferruginous hind fringes.

Dimensions.-- Length: queen, 15 mm. to 19 mm.; worker, 11 mm. to 15 mm.; male, 12 mm. to 16 mm.; Spread of wings:
queen, 32 mm. to 41 mm.; worker, 26 mm. to 32 mm.; male, 30 mm. to 33 mm. Width of abdomen at second segment: queen, $8\frac{1}{2}$ mm. to $10\frac{1}{2}$ mm.; worker, $5\frac{1}{2}$ mm. to $8\frac{1}{2}$ mm.; male, 6 mm. to 7 mm.

l. c. Franklin.
Bombus bimaculatus Cresson.

This is not a very variable species and has no close ally which is taken up in this paper. I have only two specimens before me, one a borrowed specimen from the collection at the Kansas State Agricultural College and another which was collected in Douglas County, Kansas, last summer by R. H. Reamer. *B. bimaculatus* is a new species to the Snow Entomological Collections. This is the first time that it has been reported from Kansas. It has been reported from Ohio, Pennsylvania, West Virginia, Maryland, Canada, Nebraska, and Louisiana. It is not one of the more common species in any part of its habitat.
Bombus huntii (Greene).

This species was not found very abundantly, only about three dozen specimens being collected among all the others. It is very closely allied to B. edwardsii Cress. and is sometimes called the extreme red form of it, but can always be separated from it by the black corbicular fringes of the females and by the straight hind border of the interalar band. The species is noted for the constancy of its characters; the colors are usually bright and clearly defined, except for the fading into yellow of the second and third dorsal abdominal segments quite frequently. Most of the specimens which I have are workers which were taken in the field, at Creede, Colo., at an altitude of 8844 ft. I have a few specimens from Beaver Creek, Mont., alt. 6300 ft. and a few from Rock River, Wyoming, alt. 6910 ft. One of these specimens is a freak and a full description of it is given following the original description.

The following additional habitat records have been reported: Washington, Oregon, California, Utah, Idaho, Nevada, New Mexico, Nebraska, North Dakota, South Dakota, Arizona, Oklahoma, Texas, Canada, Alberta, Assiniboia. In some parts of its habitat, especially in Colorado,
this species is supposed to be the most common one present but we did not find it so in our collecting as there were several others much more prevalent. It is new to the Snow Entomological Collections.

**Bombus huntii Greene.** (Original description).

Pile of medium length and rather course. Face and occiput yellow; thorax mostly yellow but with a broad black band between the wings with its hind border nearly straight. Dorsum of abdomen with first and fourth segments yellow, second and third, ferruginous-red, fifth and sixth, black (in the females). Females with legs dark and corbicular fringes black. Malar space of medium length.

**Queen.** Head.—Slightly elongate. Face largely covered with rather dense yellow pile; occiput with a large triangle of yellow pile; cheeks black. Labrum with tubercle-like areas large and well separated, their summits rather strongly concaved and margins rather sharply elevated; spaces between these areas and above the shelf-like projection deeply excavated; shelf-like projection rather narrow, but prominent; translucent spots usually plainly visible to the naked eye. Mandible, at most, with only a slight indication of a fourth tooth.
Malar space somewhat shorter than its width at the apex, about one-fifth as long as the eye. Clypeus coarsely but rather sparsely punctate. Flagellum of antennae somewhat less than twice as long as the scape; third antennal segment much longer than the fifth, fifth somewhat longer than the fourth.

**Thorax.**—Dorsum: covered with yellow pile, except for a black band between the bases of the wings, the hind margin of this band not extending back onto the scutellum in the middle; mesopleura mostly covered with yellow pile, but the yellow not reaching the bases of the legs and often coming considerably short of it, sometimes nearly the whole lower half black; metapleura and sides of median segment often bearing very little but dark pile, but often with nearly pure yellow pile; center of disc naked, smooth and shining.

**Abdomen.**—Dorsum: segment one yellow; segments two and three ferruginous-red; segment four yellow; segments five and six black, but with the sides of the apical margins of some of the middle segments fringed with yellow hairs, especially of segments three and four.

**Wings.**—Rather strongly, but not deeply, stained with brown; the fore pair lightest across the middle and
darkest in the median and submedian cells, in the anterior portion of the radial cell and in the region beyond the veins.

**Legs.**—Black with corbicular fringes black, rarely with a few light hairs at the bases of some of the femora.

**Worker.**—Much like the queen, but with wings usually somewhat lighter, in many cases almost subhyaline; mesopleura usually covered with yellow pile to the bases of the legs; metapleura and sides of median segment usually yellow.

**Male.** Head.—Triangular in outline as viewed from in front. Face, occiput and cheeks mostly clothed with dense yellow pile, the yellow on the cheeks, connected with that on the occiput. Lalar space distinctly longer than its width at the apex. Clypeus covered up with dense, pure yellow pile. Flagellum of antenna about two and three-fourths times as long as the scape; third antennal segment and fifth segment subequal in length, the fourth shorter than either.

**Thorax.**—Coloration of pile much like that of worker; but the black interalar band rather narrower and less sharply defined; pleura always well covered with yellow pile to the bases of the legs; metapleura and sides of median segment always yellow.

**Abdomen.**—Dorsum: segment one yellow; segments two
and three ferruginous-red; segments four and five yellow, but sometimes with black hairs admixed in the middle; segments six and seven black. Venter with the apical margins of the segments fringed for the most part with yellow pile.

**Genitalia.**—Outer spatha variable; short and wide, its side margins usually somewhat irregular; anterior lateral projections rather narrow and rounded at their ends; ventral surface of apical portion with a somewhat scattering tuft of rather long hairs on each side. Inner spatha variable, lateral margins strongly and rather evenly incurved; posterior margin rather strongly curved forward in the middle, making the apex distinctly, though not strongly, bilobed; an elongate fenestra on each side of the middle line of the apical portion, though they are sometimes entirely absent; ventral surface of apical portion rather densely hairy on each side and also, to a considerable extent, in the middle between the fenestrae. Clasper and sagitta like those for this group, but with the volsella much narrower throughout their entire length. Shafts of sagittae rather strongly bent outward in the middle.

**Wings.**—Subhyaline; about like those of worker.

**Legs.**—Coxae, trochanters, and femora all bearing
a considerable amount of yellow pile; fore tibia dark; middle tibia mostly dark, but often with some ferruginous hair on their hind sides; fringes of hind tibia usually more or less yellowish or ferruginous. Outer faces of hind tibia somewhat convex and mostly naked. Posterior metatarsi with short, dark, or ferruginous hind fringes.

Dimensions.— Length: queen, 14 mm. to 19 mm.; worker, 9 mm. to 13 mm.; male, 11 mm. to 12 mm. Spread of fore wings: queen, 36 mm. to 37 mm.; worker, 20 mm. to 28 mm.; male, 25 mm. to 27 mm. Width of abdomen at second segment: queen, 8½ mm. to 10 mm.; worker, 4½ mm. to 6 mm.; male, 5½ mm. to 6½ mm.

l. c. Franklin.

**Bombus huntii Greene.** (Freakish specimen).

**Queen.** Head.— Slightly elongate. Face mostly covered with rather dense yellow pile; occiput with a large triangle of yellow pile; cheeks black; labrum with tubercle-like areas large and well separated, their summits rather strongly concaved and margins rather sharply elevated; space between these areas and above the shelf-like projection deeply excavated; shelf-like projection rather narrow, but prominent; translucent spots usually
plainly visible to the naked eye. Mandible, at most, with only a slight indication of a fourth tooth. Malar space somewhat shorter than its width at apex, about one-fifth as long as the eye. Clypeus coarsely but rather sparsely punctate. Flagellum of antenna somewhat less than twice as long as the scape; third antennal segment much longer than the fifth, the fifth somewhat longer than the fourth.

**Thorax.**—Dorsum covered with yellow pile, except for a broad black interalar band between the bases of the wings, the hind margin of this band not extending back much onto the scutellum in the middle; center of disc naked, smooth and shining; mesopleura mostly covered with yellow pile, but the yellow not reaching the bases of the legs by coming considerably short of it; metapleura and sides of median segment bearing very little but dark pile.

**Abdomen.**—Dorsum: segment one, two, and three and four ferruginous yellow except for a black triangular space on the middle of segments one and two with the apex reaching to the apical edge of segment two and the base reaching the basal edge of segment one; segment five and six are black. Venter mostly black but with sides of the apical margins of some of the middle segments fringed with yellow
hairs, especially of segments three and four.

**Wings.**—Rather strongly but not deeply stained with brown, the fore pair lightest across the middle and darkest in the median and submedian cells, in the anterior portion of the radial cell and in the region beyond the veins.

**Legs.**—Black, with corbicular fringes black.

**Dimensions.**—Length: 20 mm.; spread of fore wing, 37 mm.; width of abdomen at second segment, 10 mm.
Bembus edwardsii Cresson.

This is one of four of the most variable species taken up in this paper. It shares the honor with B. rufocinctus Cress. of causing the workers on Bombidae of North America more trouble than any others. The closest ally of this species, which I have studied, is Bombus huntii Greene; from which it can be readily separated by the difference in the form of the posterior border of the interalar bend and by the difference in the color of the corbicular fringes.

It is new to the Snow Entomological Collections. It has been reported from Alaska, British Columbia, Alberta, Vancouver Island, Montana, Colorado, New Mexico, Nevada, Utah, Washington, Idaho, and California. It was found to be one of the most common species in Colorado by the collecting party of 1914. I have before me one hundred sixty nine specimens of this species, thirty-five of which were collected at Beaver Creek, Montana. None of these were queens. I have three males from Beaver Creek, Mont., and one male from Creede, Colo., which represent two new color variants of this species according to Prof. H. J. Franklin of the Mass. Agricultural College, to whom
they were sent for verification of determination. I am including a complete description of each of these color variants following the original description of this species.

Two hundred and fifty specimens of *B. edwardsii* were taken in 1914 from a large nest in Colo. These specimens, together with those which were taken at large in the field, afford a good opportunity for the study of the variations of the species. The Montana specimens of this species, as well as those of some others seem to show darker coloration of pile in general than of the specimens taken in southern Colorado. Comparatively speaking this is true—though extremes may be found in each locality.

Many of the Colorado specimens have the second and third dorsal abdominal segments largely covered with ferruginous-red pile while the same segments of the abdomen of many specimens from Montana have these segments mostly covered with darker pile. Many of the Color Variants given following the original description are represented by the specimens which I have studied.

Nest of *Bombus edwardsii* Cresson.

The Kansas University Entomological Expedition of the summer of 1914, of which the author was a member, was for-
tunate in having a nest of *B. edwardsii* located in its camp, which was seven and one-half miles southwest of Creede, Colo. The nest was discovered on July 30 by Prof. Hungerford. The entrance to the nest was immediately protected by means of a tripod of sticks. The little bees came and went without being disturbed until Aug., 27. On that morning before the bees became active, a large cyanide jar was opened and turned upside down over the entrance to the nest at the surface of the ground. By noon, most of the workers had been killed by the cyanide. As we dug toward the nest, the queens and males were not so much affected by the cyanide and perhaps a dozen of them escaped.

The entrance to the nest went in toward the south, a small hole about one-half inch in diameter, and made two complete turns with six inches of the surface of the ground. The burrow of some animal was then reached and by finding a stupefied bee occasionally we were able to follow the correct burrow to the nest. We finally found a straight place, which was about eighteen inches long and lined with paper, in the burrow. At the distal end of this straight place in the burrow and about four inches to the right, the nest was found. (See Fig. 13). It was about eight inches in diameter and contained much honey and a large
brood. It was located about eight feet from where we had begun to dig and it was about eighteen inches below the surface of the ground. The soil where the nest was found was a black sandy loam and was located just at the edge of the timber.

No Psithyrus or guestbees were found in connection with the nest but there were about a dozen inquilines in the burrow. These were Orthoptera belonging to the family of Locustidae and genus Ceutophilus. The nest contained eighty queens, one hundred twenty-seven workers, and forty-three males. All stages of development in the life-history of the bumblebee were also found in the brood. Much natural variation in coloration was noted in the bees. Some, which had just emerged, were much lighter in color than others. One queen was found to have one of the compound eyes peculiarly divided. A complete description of this specimen is given under the discussion of this species. (See Figures 16 & 17.)

*Bombus edwardsii* Cresson. (Original description).

Pile of medium length, rather coarse. Face and occiput yellow; thorax mostly yellow or whitish with a broad black interalar band; first and fourth dorsal abdom-
inal segments entirely covered with yellow pile; two apical segments black; corbicular fringes strongly ferruginous; malar space short.

Queen. Head.-- Somewhat rounded, trapeziform. Face with a large patch of pure whitish yellow pile extending above and below the bases of the antennae, this patch not reaching the inner margins of the eyes on either side; occiput with median triangular whitish-yellow patch of pile usually without black intermixed, but sometimes with a few black hairs present among the yellow; sides behind the eyes black. Tubercle-like areas of labrum rather sharply and deeply concaved at summit, the concave area nearly smooth; median shelf-like projection moderately broad; translucent areas large enough to be faintly visible to the naked eye. Malar space wider at apex than long, less than one-fifth as long as the eye; clypeus moderately and rather coarsely punctate; flagellum of antennae not more than twice as long as the scape; third antennal segment much longer than the fifth, fifth somewhat longer than the fourth.

Thorax.-- Anterior part of dorsum covered with whitish yellow pile, sometimes with a slight admixture of black hairs, sides of scutellum pale yellow, sometimes with some black hairs intermixed. Broad black interalar band between
the bases of the wings, its posterior border extending backward in the middle across the scutellum; mesopleura covered with yellow pile for about half the way from the bases of the wings toward the bases of the legs, the lower part being entirely dark; lower part of metapleura always dark, upper part sometimes dark and sometimes yellow; sides of median segment with black or yellow pile or black and yellow pile mixed. Middle of disc naked, smooth and shining.

Abdomen.-- Dorsum: segment one covered with yellow pile on the sides, but dark and nearly bare in the middle; segment two covered with ferruginous-red pile, except basal middle, this being black; segment three covered with ferruginous-red pile; segment four covered usually with a fringe of yellow hairs; segment five entirely black, except the apical margin usually with a fringe of yellow hairs; segment six black. Venter with apical margins of all the segments, except the first and last, fringed with light yellow hair. Hypopygium without distinct median carina.

Wings.-- Slightly stained with brown; fore wings darkest on median and submedian cells and about the tip of the radial cell and often also on the region beyond the veins.

Legs.-- Coxae usually entirely black, sometimes with a few yellow hairs at tips; trochanters occasionally entirely
black, but usually with a noticeable amount of light hair on the lower side; fore femora usually entirely black, at most with but very little light pile at bases; middle femora mostly black, but usually with some light hair at the bases on the lower side; posterior femora almost always with considerable light pile on the basal two-fifths of the lower side and very often with a touch of yellow hair on the outer side near the distal end; fore and middle tibia mostly black, but usually with considerable ferruginous hair on hind sides, especially toward the apices; corbicular fringes always strongly ferruginous, sometimes with black hairs mixed in.

**Worker. Head.**—Much like that of queen, but with pile on face and occiput very light, almost white, and the pleura often covered with light pile to the bases of the legs; metapleura often entirely covered with light pile; sides of median segment usually covered with the same light pile, but sometimes with only dark pile.

**Abdomen.** Dorsum: first segment almost destitute of pile in the middle, the sides covered with whitish hair; second segment usually entirely covered with black, sometimes with light yellow pile on the basal middle; third segment usually entirely black; fourth segment sometimes with basal portion black, but usually entirely yellow;
two apical segments black. Venter with apical margins of segments fringed with pile of same color as that of queen.

Wings.— Subhyaline; sometimes lighter than those of the queen.

Legs.— Fore legs always entirely black; middle coxae, trochanters, and bases of femora usually with a very small amount of light hair, sometimes entirely dark; middle tibia dark; hind coxae, trochanter and bases of femora on lower side usually with a very noticeable amount of light hair; corbicular fringes more or less strongly ferruginous, usually with an admixture of black hairs of varying amount; anterior and middle tibia dark.

Male. Head.— Shaped much as in female; face covered with a large patch of usually pure pale yellow pile, this patch very nearly reaching the inner margins of the eyes on either side; occiput bearing a triangular patch of usually pure pale yellow pile; sides of head, behind the eyes, with a large amount of yellow pile. Margin of labrum usually but very slightly incurved in front; malar space distinctly less than one-fourth as long as the eye; clypeus well covered up with yellow pile; flagellum of antennae a little less than two and one-third times as long as the scape; third and fifth antennal segments sub-
equal in length, the fourth somewhat shorter than either.

Thorax.— Much like that of worker in coloration, but with pleura always yellow to the bases of legs, meta-pleura always entirely covered with yellow pile and sides of median segment having at most not a very strong admixture of black hairs with the yellow on the sides; black interalar band somewhat narrower than that of worker and less sharply defined.

Abdomen.— Dorsum: segment one covered with yellow pile; segment two with basal middle yellow, the rest black; segment three often entirely black, but usually with considerable yellow pile on the sides, especially near the apical margin; segment four entirely covered with yellow pile; segment five often entirely yellow, but as often with considerable black hair on the middle apical portion; segments six and seven usually entirely black, but sometimes with a very slight sprinkling of yellow hairs mixed with the black. Venter rather sparsely clothed with light pile.

Genitalia. (See description under New Color Variants.)

Wings.— About like those of workers.

Legs.— Coxae, trochanters, and femora bearing a large amount of yellow pile, in most cases mainly clothed with it; fore and middle tibia mostly black but with a
usually strong posterior fringe of ferruginous pile of varying shade; posterior tibia with outer faces convex and naked, in some specimens with a few scattered hairs, anterior fringes rather short and posterior ones long, thus forming the distinct but weak corbiculae; hind metatarsi with rather long posterior fringes.

Color Variants.

**Color Variant 1.**-- Queen, typical described above and worker like it.

**Color Variant 2.**-- Queen and worker like typical queen, but with the anterior two-thirds of the second dorsal abdominal segment entirely covered with black pile and a median V-like projection of the same color extending backward from this across, or nearly across, the third segment; sides of the posterior portion of the second segment and sides of the third segment covered with ferruginous-red or yellowish-ferruginous (of greatly varying shade) pile; yellow pile on thorax very light, almost white.

**Color Variant 3.**-- Queen and worker like Color Variant 2, but with the second dorsal abdominal segment bearing only a touch of light yellowish-ferruginous pile on the sides of the apical portion and with segment three having the anterior half covered with black pile; mesopleura cov-
ered with yellow pile nearly to bases of legs.

**Color Variant 4.**—Queen and worker like Color Variant 3, but with second dorsal abdominal segment entirely black and third segment bearing ferruginous pile only on its apical margin.

**Color Variant 5.**—Queen and worker like Color Variant 3, but with second dorsal abdominal segments two and three entirely black—typical worker (edwardsii Cresson).

**Male Color Variant 1.**—The typical form described above.

**Male Color Variant 2.**—Like Male Color Variant 1, but with sides of dorsal segment three bearing ferruginous pile.

**Male Color Variant 3.**—Like the first male color variants, but with the second and third dorsal abdominal segments entirely covered with ferruginous-red pile.

**Male Color Variant 4.**—Like Male Color Variant 1, but with the second dorsal abdominal segment entirely covered with yellow pile.

1. c. Franklin.

*Bombus edwardsii* Cresson. (New Color Variant).

**Male.** Head.—Somewhat rounded trapeziform. Face covered with a large patch of pure yellow pile, this patch very nearly reaching the inner margins of the eyes on either
side; occiput bearing a large, more or less triangular, patch of pale yellow pile. Surface and margin of labrum usually but very slightly incurved in front; malar space very short, distinctly less than one-fourth as long as the eye; clypeus well covered with yellow pile; flagellum of antennae a little less than two and one-third times as long as the scape; third and fifth antennal segments subequal in length, the fourth somewhat shorter than either.

Thorax.— Pleura yellow to the bases of legs, meta-pleura entirely covered with yellow pile and sides of median segment having not a very strong admixture of dark hairs with the yellow of the sides; black interalar band rather narrow and less sharply defined than that of the worker usually is; posterior border of interalar band extending backward indistinctly in the middle across the scutellum. Anterior part of dorsum of thorax covered with whitish-yellow pile.

Abdomen.— Segment one covered with yellow pile; segment two with basal middle yellow, the rest ferruginous-red; segment three entirely ferruginous-red; segment four and five entirely yellow; segments six and seven covered with black pile except for a few yellow hairs on the sides. Venter sparsely clothed with light pile.
Genitalia.— (Lich like that of other *E. edwardsii* which I have examined) The original description follows:

Outer spatha short and wide, its side margins usually somewhat irregular; anterior lateral projections rather narrow and rounded at their ends; ventral surface of apical portion, with a somewhat scattering tuft of rather long hairs on each side. Inner spatha somewhat variable; lateral margins strongly and rather evenly incurved; posterior margin rather strongly curved forward in the middle, making the apex distinctly, though not strongly, bilobed; an elongate fenestra on each side of the middle line of the apical portion; ventral surface of apical portion rather densely hairy on each side and also, to a considerable extent, in the middle between the fenestrae. Claspers rather slender and weak; the apex of each branch as seen from above broadly rounded, its inner side, in most cases, more or less pointed and passing the inner margin of the volsella; volsella long and slender, usually of about the same width throughout, except at the base, where it is a little wider; squama triangular in outline, the inner lobe being vestigial or absent; squama suddenly wider at the base so as to be distinctly notched on the inner side instead of being evenly incurved; sagittae with long slender shafts bent outward
somewhat in the middle; sagittae with a sickle-shaped head, the plane of the sickle being about at right angles with the shaft with its tip directed ventrally.

**Wings.**—Slightly stained with brown; fore wings darker than hind ones and darkest on median and submedian cells.

**Legs.**—Coxae, trochanters, and femora bearing a large amount of yellow pile, nearly clothed with it. Fore and middle tibia mostly blackish-ferruginous; posterior tibia with outer faces convex and nearly naked, with a few scattered hairs, anterior fringes rather short and posterior ones rather long, thus forming the distinct but weak corbiculae; hind metatarsi with rather long posterior fringes.

**Dimensions.**—Length, 10 mm. to 12 mm.; spread of wings, 24 mm. to 26 mm.; width of abdomen at second segment, male, 5 mm. to 6 mm.

*Bombus edwardsii* Cresson. (New Color Variant).

**Male.** Head. Somewhat rounded trapeziform; face covered with a large patch of pure pale yellow pile, this patch very nearly reaching the inner margins of the eyes on either side; occiput usually bearing a triangular patch of pure pale yellow pile; sides of head behind the eyes, with a large amount of yellow pile. Margin of labrum
usually but very slightly incurved in front; malar space
less than one-fourth as long as the eye; clypeus well
tered up with yellow pile; flagellum of antennae a little
less than two and one-third times as long as the scape;
third and fifth antennal segments subequal in length, the
fourth somewhat shorter than either.

Thorax.-- Anterior part of dorsum covered with light
yellow pile; pleura yellow to bases of legs, metapleura al­
ways entirely covered with yellow pile and sides of median
segment having at most not a very strong admixture of black
hairs with yellow on the sides; black interalar band fairly
wide and not very distinct.

Abdomen.-- Dorsum: Segment one covered with yellow
pile; second segment yellow except for a small patch of
ferruginous-black pile on each side. Segment three en­
tirely ferruginous-black except for a few light hairs on
the sides and on the apical margin; segments four and five
entirely yellow; segments six and seven black except for a
few light hairs on the sides. Venter rather sparsely
clothed with light pile.

Genitalia.-- Same as given for preceding Color Variant.

Wings.-- Slightly stained with brown; fore wings dark­
er than hind ones and darkest along the anterior margin
from base to apex.

**Legs.**—Coxae, trochanters, and femora bearing a large amount of yellow pile, in most cases mainly clothed with it; fore and middle tibia blackish ferruginous, with a usually strong posterior fringe of ferruginous pile of varying shade; posterior tibia with outer faces convex and nearly naked with a few scattered hairs, anterior fringes rather short and posterior ones long, thus forming a distinct, but weak, corbiculae; hind metatarsi with rather long posterior fringes.

**Dimensions.**—Length; 12 mm. Spread of wings, 26 mm. Width of abdomen at second segment, 6 mm.

*Bombus edwardsii* Cresson. (Queen with freakish eye).

**Head.**—Somewhat rounded trapeziform. Face with a large patch of pure whitish yellow pile extending above and below the bases of the antennae, this patch not reaching the inner margins of the eyes on either side; occiput with a median triangular whitish-yellow patch of yellow pile with a few black hairs present among the yellow; sides behind the eyes black. Tubercle-like areas of labrum rather deeply and sharply concaved at summit, the concave area rather smooth; median shelf-like projection moderately broad; translucent areas large enough to be faintly visible
to the naked eye. Labral space wider at apex than long, less than one-fifth as long as the eye; clypeus moderately and rather coarsely punctate; flagellum of antennae not more than twice as long as the scape; third antennal segment much longer than the fifth, fifth somewhat longer than the fourth. Right eye peculiarly divided, upper two-thirds of it almost entirely divided or separated from the lower one-third as shown in Figures 16 & 17.

Thorax.—Anterior part of dorsum covered with whitish-yellow pile, with a slight admixture of black hairs; sides of scutellum slightly yellow with dark hairs entirely at the lower part next to the bases of the legs. Abroad black band between the bases of the wings, its posterior border extending backward in the middle across the scutellum; mesopleura covered with yellow pile for about half the way from the bases of the wings toward the bases of the legs, the lower part being entirely dark; lower part of metapleura always dark, upper part yellow; sides of median segment black and yellow pile mixed. Middle of disc naked, smooth, and shining.

Abdomen.—Dorsum: segment covered with yellow pile on the sides but dark and nearly bare in the middle; segment covered with ferruginous-red pile, except basal middle,
which is black; segment three covered with ferruginous-red pile; segment four is black except for the apical margin which is ferruginous-red; segment five is entirely black; segment six black; Venter with apical margins of all the segments, except the first and last, fringed with light yellow hair. Hypopygium without a distinct median carina.

Wings.—Slightly stained with brown; forewings darkest on median and submedian cells and about the tip of the radial cell and on the region beyond the veins.

Legs.—Coxae entirely black with no yellow hairs at the tips; no light hair on the trochanters; fore femora with a very little light pile at its bases; middle and hind femora covered with dark pile entirely or at least there is no noticeable amount of yellow pile; fore and middle tibia mostly black, but with considerable ferruginous hair on hind sides especially toward the apices; corbicular fringes strongly ferruginous with a few black hairs mixed in on the anterior side.

Dimensions.—Length, $18^{1/2}$ mm. Spread of wings, 33 mm. Width of abdomen at second segment, $7^{1/2}$ mm.

Habitat.—Creede, Colorado. Altitude, 8844 feet.
Bombus melanopygus Nylander.

This species is not closely allied to another which I discuss in this paper. It is also not considered very variable. It has been reported mostly from Alaska and the Western part of Canada, west of the Rocky Mountains. I have six workers and one male from Beaver Creek, Montana, thirteen workers and seven males from Creede, Colorado, and one queen from Sitka, Alaska, and one worker from Alaska. The latter was the sole representative of this species in the Snow Entomological Collections. The queen from Sitka, Alaska, was borrowed from the collection from the Kansas State Agricultural College at Manhattan, Kansas. This is the first time that melanopygus has been reported from Montana. It has been reported from Washington, Oregon, Wyoming, and Colorado before, though it is reported as very rare in the two last named states.

While this is not a very variable species, there are some variations. Most of the workers which I have, have the dark pile on the face and occiput predominating but some have more of the yellowish pile present. The pile on the scutellum is nearly all yellow on the specimens before me though some have considerable dark pile
mixed in along with the yellow pile. The dorsum of the abdominal segments varies in the coloration of the pile much as in other species. The specimens before me have the fourth dorsal abdominal segment covered with yellow, black, and ferruginous pile in various proportions in the different specimens. The corbicular fringes of these specimens are mostly entirely black, instead of being mostly strongly ferruginous with black hairs intermixed as described in the original description.

The males seem to have more sharply defined colors and therefore have a distinguishable interalar band. Only a few black hairs are found among the yellow hairs which cover the face and occiput. The coloration of the dorsum of the abdomen is quite variable with a mixture of ferruginous, yellow, and black pile for a covering in various proportions, though the dark colors predominate usually.
Bombus flavifrons Cresson.

*B. flavifrons* has been reported from Alaska, Alberta, British Columbia, Washington, Idaho, Montana, Utah, Colorado, and New Mexico. I am reporting it from Arizona for the first time, as I find a worker of this species in the Snow Entomological Collections. It was taken by F. H. Snow at the base of Humphrey's Peak in Arizona, at an altitude of 9,500 feet. It seems to be quite a common species throughout the most of its habitat.

This species is quite variable and is closely allied to *B. centralis* Cress. from which it may be distinguished by means of the different coloration of the dorsum of the thorax and by the somewhat longer malar space of the females. I have forty-two specimens before me, of which six males and six workers are from Beaver Creek, Montana, one worker from Arizona, and the remaining forms are from Creede, Colo., except one worker which bears a label from Magdelena, Mountains, New Mexico. The specimens from Montana are darker in coloration on the whole than the more southern ones. I have one worker from Beaver Creek, Montana, which measures only seven mm. in length. The ordinary length reported for workers is from nine to twelve mm.
Bombus flavifrons Cresson. (Original description).

Pile of medium length and rather coarse in texture. Face and occiput with considerable yellow pile; dorsum of thorax largely covered with a mixture of yellow and dark pile; mesopleura yellow to the bases to the bases of the legs; dorsum of abdomen with the basal segments yellow, third and fourth segments variable and the two apical segments dark; bases of legs with considerable light pile; wings subhyaline. Malar space long.

Queen. Head.---Elongate trapeziform. Face with a large patch of generally pure light, often whitish, yellow pile reaching some distance above and below the bases of the antennae, sometimes with an admixture of dark hairs; occiput sometimes with a triangular patch of pure light yellow pile, but usually with an admixture of dark hairs; ventro-lateral parts sometimes with a small amount of light pile, often connecting with the light patch on the occiput. Labrum with tubercle-like areas moderately separated, their margins rounded and summits flat or somewhat concaved; shelf-like projection not very prominent. Malar space longer than its width at apex, fully one-fourth as long as the eye. Clypeus rather finely and sparsely punctate over the disc. Flagellum of antennae about twice as
long as the scape; third antennal segment much longer than the fifth, the fifth longer than the fourth.

Thorax.— The greater part of the dorsum covered with a mixture of black and yellow pile and thus having a distinctly clouded appearance, being darkest between the bases of the wings; the center of the disc naked; mesopleura covered with yellow pile to the bases of the legs; metapleura sometimes largely clothed with dark pile, but usually bearing light pile for the most part; sides of the median segment often entirely dark, but usually bearing a mixture of light and dark hairs.

Abdomen.— Dorsum: segment one with dark pile on the middle and yellow on the sides, or nearly entirely clothed with yellow pile; segment two entirely covered with yellow pile or with a more or less definite triangular median patch of dark pile, the base of this triangle being on the base of the segment and its apex on or near the apical margin; segments three and four entirely covered with ferruginous-red pile; segment five dark, but the apical margin often fringed with light hairs; segment six dark, but sometimes with some light hair on the sides. Venter with the apical margins of the segments fringed, for the most part, with yellow hairs. Hypopygium with a median
carina on its apical portion.

Wings.— Subhyaline, only slightly stained with brown; the fore pair lightest across their middle portions.

Legs.— Coxae sometimes entirely dark, but usually with some light pile; fore and middle tibia dark, often with a few ferruginous hairs; corbicular fringes sometimes entirely dark, but usually with more or less ferruginous hairs.

Worker.— Much like the queen, but the amount of yellow pile on the face usually less, this sometimes being reduced to a mere tuft between the bases of the antennae; occiput usually with dark and yellow hair mixed, but occasionally dark; the femora often with very little light pile.

Male.— Head. Face largely covered with a dense patch of pure yellow pile; occiput largely covered with yellow pile; cheeks bearing a large amount of yellow hair, this connected with the yellow on the occiput. Malar space much longer than its width at the apex, fully one-third as long as the eye. Clypeus mostly covered with yellow pile. Flagellum of antennae about three times as long as the scape; the third antennal segment longer than the fifth; the fifth longer than the fourth.

Thorax.— Clothed mostly with yellow pile, but the dorsum with black and yellow pile mixed between the wings.
Abdomen.— Dorsum: segments one and two entirely covered with yellow pile; segments three and four clothed with ferruginous pile; segments five, six, and seven, dark but sometimes with a slight admixture of light hairs. Venter clothed mostly with light pile.

Genitalia.— Very much like those of B. centralis.

Wings.— Somewhat lighter than those of the queen.

Legs.— Coxae, trochanters, and femora all with a large amount of light pile, mostly yellowish; fore and middle tibia with considerable light or ferruginous pile; hind tibia with outer faces slightly convex and naked, the fringes mostly yellow; hind metatarsi with posterior fringes light yellow or ferruginous.

Dimensions.— Length: queen, 13 mm. to 16 mm.; worker, 9 mm. to 12 mm.; male, 11 mm. to 12 mm. Spread of wings: queen, 27 mm. to 34 mm.; worker, 19 mm. to 27 mm.; male, 25 mm. to 26 mm.; width of abdomen at second segment: queen, 7 mm. to 9 mm.; worker, 4½ mm. to 7 mm.; male, 5 mm. to 6 mm.

Color Variant 1.— Queen and worker like typical females, but with the extreme sides of the third dorsal abdominal segment bearing black pile and with a considerable portion of the fourth dorsal segment largely clothed with
Color Variant 2.-- Queen and worker like the typical females, but with all the dorsal abdominal segments beyond the second entirely dark.

Color Variant 3.-- Queen and worker like the typical females, but with a small amount of ferruginous pile on the middle of the second dorsal abdominal segment.

l. c.: Franklin.
Bombus centralis Cresson.

This is a very common species throughout the state of Colorado and is very closely allied to *B. flavifrons* from which it can be distinguished by the more distinct black interalar band of both sexes and also by the shorter malar space of its females. The following habitat records have been reported: British Columbia, Washington, Idaho, Montana, Wyoming, Oregon, Utah, Nevada, California, Colorado, Nebraska, New Mexico, and Arizona.

I have eighty-two specimens; fifteen, one queen, two males, and twelve workers, are from Beaver Creek, Mont., one worker from Estes Park, Colorado, and the remaining forms, one queen, thirty-six workers, and twenty-nine males, are from Creede, Colorado. This is quite a variable species in the coloration of the pile on the first and second dorsal abdominal segments which are generally covered with more or less yellowish pile. The first segment ranges from entirely yellow to black in the middle with yellow on the sides; the second segment is more variable, ranging from entirely yellow to black or ferruginous, or at least a tringular patch of pile (the base of the triangle being at the base of the segment and the apex of the triangle at
or toward the apex of the segment) being ferruginous or black. Among the males, the interalar band is much more distinct in some than in others, though it is poorly defined in all. The thorax is covered with pile, in some cases, which borders on the ferruginous— at least it is a ferruginous-yellowish pile.

**Bombus centralis Cresson.** (Original description).

Pile of medium length and texture. Face and occiput largely yellow. Thorax mostly yellow, but with a distinct black band between the bases of the wings. Dorsum of abdomen usually mostly yellow on the two basal segments, ferruginous-red on the third and fourth segments and dark on the apical segments. Venter with apical margins of segments largely fringed with yellow hairs. Wings not very dark. Bases of legs with considerable light pile.

**Queen.**—Head. Face with a large patch of generally pure yellow pile reaching some distance above and below the bases of the antennae. Occiput with a large triangular patch of yellow pile, often connecting with some yellow hair on the cheeks. Labrum with tubercle-like areas fairly well separated, the region between them and the shelf-like
projection moderately broad and prominent. Malar space somewhat longer than its width at the apex, between one-fifth and one-fourth as long as the eye. Clypeus finely and somewhat sparsely punctate over the disc. Flagellum of antennae about twice as long as the scape; third antennal segment much longer than the fifth, the fifth somewhat longer than the fourth.

Thorax.-- Dorsum entirely covered with yellow pile, except for a well defined interalar band; center of disc naked; smooth and shining; mesopleura usually entirely covered with yellow pile to the bases of the legs, but occasionally with their very lowest parts dark; metapleura and sides of median segment usually clothed mostly or entirely with yellow pile, but occasionally entirely dark.

Abdomen.-- Dorsum: segment one entirely yellow or black in the middle with large tufts of yellow on the extreme sides; segment two entirely yellow or with more or less definite median triangular patch of black or more or less ferruginous pile, the base of the triangle being on the base of the segment and the apex toward or on the apical margin of the segment; segments three and four mostly covered with ferruginous-red pile, but the extreme side margins bearing yellow pile; segments five and six black;
enter with the apical margins of most of the segments strongly fringed with yellow hairs. Hypopygium with a medium carina on its apical margin.

Wings.-- Somewhat stained with brown, but not strongly so; the fore pair lightest across their middle portions.

Legs.-- Coxae entirely dark or with some light pile; trochanters almost always with considerable light pile on their lower sides; femora occasionally entirely dark, but usually with a large amount of light pile; fore and middle tibia dark, but often with a little ferruginous pile, on their hind sides near their tips; corbicular fringes black or more or less strongly ferruginous.

Worker.-- Much like the queen but the yellow pile on the occiput often with black hairs strongly intermixed; metapleura and sides of median segment always clothed with yellow pile; the two basal dorsal abdominal segments entirely covered with yellow pile.

Male. Head.-- Face densely covered with a patch of pure yellow pile; occiput with a large triangular patch of yellow pile connected on each side with a large amount of similar pile sometimes nearly covering the cheek. Malar space distinctly longer than its width at the apex, about one-fourth as long as long as the eye. Clypeus mostly
covered up with yellow pile. Flagellum of antennae about three times as long as the scape; third antennal segment somewhat longer than the fifth, the fifth distinctly longer than the fourth.

**Thorax.**—Clothed with yellow pile, except for a narrow and usually poorly defined black interalar band; this band sometimes almost entirely obliterated by yellow hairs.

**Abdomen.**—Dorsum: segments one and two entirely yellow; segments three and four covered with ferruginous pile; segment five occasionally entirely black, but usually largely, and sometimes entirely, covered with ferruginous pile; segments six and seven dark, but very often with some ferruginous hair admixed. Venter mostly clothed with yellow pile.

**Genitalia.**—Outer spatha with anterior margin broadly and somewhat deeply incurved; hind margin broadly rounded, central portion of ventral surface more or less reticulated, each side of the apical portion of the ventral surface with a scattering tuft of rather long hairs. Inner spatha with sides of front margin straight and slanting backward the side margins strongly incurved; hind margin of the apical portion protruding strongly in the middle so as to make the apex appear weakly trilobate; ventral surface
bearing rather dense hair of medium length, an elongate median fenestra present behind the center. Claspers with inner sides of the ends of the branches rather sharply pointed as viewed from above; volsellae narrow and apical projections not very prominent.

**Wings.**—Subhyaline, the fore pair darkest in the region beyond the veins.

**Legs.**—Coxae, trochanters, and femora all with much yellow pile; fore and middle tibia sometimes entirely dark, but usually with more or less light or ferruginous pile on their hind sides; hind tibia with their outer faces convex and almost or entirely naked, the fringes dark, yellow, or ferruginous; hind metatarsi usually with moderately long and ferruginous posterior fringes.

**Dimensions.**—Length: queen, 12½ mm. to 16 mm.; worker, 9½ mm. to 12½ mm.; male, 10 mm. to 13 mm.; Spread of wings: queen, 29 mm. to 33 mm.; worker, 23 mm. to 28 mm.; male, 22 mm. to 29 mm.; Width of abdomen at second segment: queen, 7 mm. to 9 mm.; worker, 4½ mm. to 6½ mm.; male, 4½ mm. to 5½ mm.

l. c. Franklin.
Bombus mixtus Cresson.

This form is found mostly in the Boreal region. I have only four specimens before me and all are new to the Snow Entomological Collections. Two workers are from Creede, Colo., and one worker and one male are from Beaver Creek, Montana. This species has been found mostly in the northern countries of this continent. It has been reported from the following states of the United States: Washington, Idaho, Montana, Oregon, California, Wyoming, and Colorado.

*B. mixtus* is not closely allied to any other species which I discuss in this paper. It is somewhat variable. The male specimen which I have, has the dorsum of the last three segments of the abdomen and of the first two segments covered with a yellowish ferruginous pile; the third and fourth segments are mostly black with a touch of light pile. The venter is clothed with exceptionally long light colored pile. (See Fig. 20). Among the three workers which I have there is considerable variation in the coloration of the pile on the face, the posterior tibia, and the dorsum of the abdomen. One specimen has much darker pile on the face than the others. Another specimen has almost entirely dark hairs on the posterior tibia to form the corbiculae. Another specimen has the dorsum of the last
three segments of the abdomen covered with bright reddish ferruginous colored pile. The amount of yellow pile on the dorsum of the first two segments of the abdomen varies considerably. The dorsum of the third segment is mostly covered with black pile in all three of the specimens.
Bombus fervidus Fabricius.

This is one of the most common species in the United States as it is found in nearly every state except some of the southern ones. I have about forty specimens before me which were collected in Colorado, Wyoming, Montana, New Mexico, Arizona, Kansas, and Massachusetts. It has been reported from a number of places in Canada also. It is closely allied to _B. californicus_. (See the discussion of that species).

Though this species is not very variable, there is a subspecies or a variety called _dorsalis_ which has the dorsum of the thorax of the queen, worker, and male completely covered with yellow pile, with no black interalar band present. The sixth dorsal abdominal segment of the male is also often entirely yellow instead of being covered with black pile or partly black and partly yellow pile. This subspecies has been reported mostly from the western part of the U. S. Only sixteen of the specimens, which I have belong to this variety.
Bombus californicus F. Sm.

I have only six specimens of this species, one of which was collected in 1894 by Dr. F. H. Snow, in Magdalena, Mountains, New Mexico, and the other five were collected in 1913 by Prof. S. J. Hunter at Beaver Creek, Montana. This is a new habitat record for this species which has been reported from Kansas, California, Alaska, British Columbia, Vancouver Island, Alberta, Saskatchewan, Washington, Oregon, Utah, Colorado, Idaho, Nevada, Wyoming, and New Mexico. It is one of the most common species of California. It is very variable in coloration, the coloration of males and females varying in a corresponding manner.

Quoting Prof. Franklin, he says, "This species has by far its nearest ally in B. fervidus F., from which I have been unable to separate it structurally. There seems to be ground for supposing that sufficient collecting may show that these two species intergrade completely."

The specimens before me are all females. The one from New Mexico is described by color variant 5 following the original description. Two specimens have a slight admixture of light hairs on segments two and three. One of these specimens has dark ferruginous pile on the hind sides of the hind tibia. The other three specimens all from
Montana, are much alike except that one of them has mostly dark pile on the sides of the thorax. The scutellum in each case is covered with yellowish light pile and the basal part of each dorsum of the second and third segments of the abdomen is covered with a slight mixture of yellowish light hairs. There is a definite sharply defined interalar band.

_Bombus californicus_ F. Sm. (Original description).

Head black; anterior portion of dorsum of thorax covered with yellow pile; wings deeply stained with brown; two apical abdominal segments black; color characters of thorax, abdomen and legs very variable—see below under variations.

_Queen._—Head. Sometimes with a slight trace of light pile mixed with the black on the face, above the bases of the antennae, otherwise with dark pile only. Labrum with borders of tubercle-like areas rounded and not sharply elevated; translucent areas sometimes large enough to be plainly visible to the naked eye, sometimes nearly absent. Malar space about one-third as long as the eye. Clypeus rather evenly, sparsely, and finely punctate. Third antennal segment much longer than the fifth, fifth distinctly but not greatly, longer than the fourth.
Thorax.— Anterior part of dorsum covered with yellow pile back to the middle of the tegulae; posterior part, including scutellum, covered with black pile. Pleura, from somewhat below the bases of the wings in front, entirely covered with black pile; sides of median segment bearing only black pile.

Abdomen.— Dorsum, except fourth segment, bearing only black pile; fourth segment entirely covered with yellow pile. Venter sparsely clothed with black hair.

Wings.— Deeply stained with brown; fore wings darkest at median and submedian cells and on anterior and apical portions of the radial cells and on the general apical region beyond the veins.

Legs.— Coxae black; trochanters usually black, but often with pile having a distinctly light tinge; femora black; fore and middle tibia and corbicular fringes black; hind metatarsi, for most part, bearing only pubescence and short spines, with a slight fringeing of short hairs on the posterior border near the base.

Worker.— Much like the queen except in size; wings usually somewhat lighter.

Male.— Head. Face above and below bases of antennae bearing yellow and black pile mixed in varying proportions,
the black being always present in very noticeable amount and often predominant; occiput with a prominent triangular patch of yellow pile, with or without black intermixed; sides of head behind the eyes with more or less yellow pile; hair immediately surrounding the upper ends of the eyes black; larar space between one-third and one-fourth as long as the eye; clypeus not covered up with pile, rather sparsely and finely punctate on the disc, the central apical portion being impunctate, smooth, and shining; fifth antennal segment nearly as long as the third and fourth taken together, third distinctly though not greatly longer than the fourth.

Thorax.-- Coloration much as in females, but with the yellow pile on the anterior part of the thorax extending down on the front sides of the pleura, in a narrowing strip to, or nearly to, the bases of the middle legs; posterior part of the mesopleura and the metapleura covered with dark pile.

Abdomen.-- Dorsum covered with black pile except segment four and five, these being covered with yellow pile. Venter bearing black pile for the most part, but with the yellow of dorsal segments four and five extending onto the extreme sides of the corresponding ventral segments and onto the extreme sides of the posterior margin of seg-
ment three; apical segment with a transverse carina of prominence a little in front of its hind margin, the area between this carina and the margin bearing short ferruginous hair.

Genitalia.-- Apical portion of inner spatha quadrangular; heads of sagittae short and with apices so strongly recurved as to appear like hollowed out shells.

Wings.-- Not very deeply stained with brown, considerably lighter than those of the queen.

Legs.-- Fore coxae black; middle and hind coxae mostly black, but usually with some yellow hairs on their outer sides; trochanters mostly black, sometimes with a very faint sprinkling of yellow; femora, fore and middle tibia, and outer sides of hind tibia black.

Dimensions.-- Length: queen, 15 mm. to 22 mm.; worker, 9 mm. to 15 mm.; male, 12 mm. to 16 mm. Spread of wings: queen, 37 mm. to 44 mm.; worker, 24 mm. to 31 mm.; male, 26 mm. to 35 mm. Width of abdomen at second segment: queen, 9 mm. to 11 mm.; worker, 5½ mm. to 9 mm.; male, 5½ mm. to 7½ mm.

Color Variant 1.-- Queen like typical californicus, but with abdomen entirely black.

Color Variant 2.-- Worker like typical californicus,
but segment four only partly covered with yellow pile.

**Color Variant 3.**— Typical *californicus* (above described.)

**Color Variant 4.**— Queen and worker like typical *californicus*, but yellow pile more or less strongly mixed with the black on the scutellum.

**Color Variant 5.**— Queen and worker like Color Variant 4, but with scutellum well covered with yellow pile, so as to have a definite black interalar band, and with yellow pile extending down some distance on the pleura, in front of the wings and with basal segment of abdomen covered with yellow.

**Color Variant 6.**— Queen like Color Variant 5, but with basal middle of second apical portion of third dorsal abdominal segment bearing yellow pile.

**Color Variant 7.**— Queen like Color Variant 6, but with yellow on pleura nearly reaching the bases of legs.

**Color Variant 8.**— Queen like Color Variant 7, but with thorax bearing black pile only on the interalar band and abdomen with a rather faint fringeing of yellow hairs on the apical margin of the second dorsal segment.

**Color Variant 9.**— Queen like Color Variant 8, but with apical half and extreme side margins of third dorsal abdominal segment covered with yellow pile and with apical
margin of the second segment strongly fringed with yellow, femora bearing considerable yellow hair.

**Male Color Variant 1.**—Like typical male, but with yellow pile on pleura not nearly reaching bases of legs, and the fourth dorsal abdominal segment bearing yellow pile only on its apical margin.

**Male Color Variant 2.**—Like the typical male, but with pleura of thorax bearing yellow pile to bases of legs, scutellum and basal dorsal segment of abdomen covered with yellow pile and with only the apical margins of dorsal segments four and five bearing yellow hair.

**Male Color Variant 3.**—Typical male (described above).

**Male Color Variant 4.**—Like Male Color Variant 2, but with dorsal abdominal segments four and five completely covered with yellow, with the basal middle of segment two and the apical margins of segments two and three bearing yellow pile and with the coxae, trochanters, and femora to their tips bearing a large amount of light hair; venter also bearing a considerable amount of light pile.

**Male Color Variant 5.**—Like Male Color Variant 4, but with first five dorsal abdominal segments, except basal middle of third, entirely covered with yellow pile; pile on apical segment somewhat ferruginous; hairs on tibia more or less strongly ferruginous; black interalar band narrow.

1. c. Franklin.
Bombus pennsylvanicus De Geer.

Throughout the greater part of its habitat this species is reported to be one of the most abundant of all those present. It was most abundantly collected by R. H. Beamer last summer in southeastern Kansas, where twenty-nine queens, two hundred nine workers, and twenty-three males were collected. I also have before me one worker from Mass., one worker from Colorado, one worker and one queen from Clark County, Kansas, one queen from Garden City, Kansas, one queen from Magdelena Mountains, New Mexico, one worker from Brownsvill, Texas, one worker from Oak Creek Canyon, Arizona, and four males, labeled as Apathus elatus Fab., in the Snow Entomological Collections.

B. fervidus and B. auricomus are somewhat closely allied with this species which is not very variable. The males of B. fervidus have the apex of the abdomen always black; all of the tibia black, except the posterior ones on the inside; pile of scutellum never with a strong admixture of black hairs. The apex of the abdomen of the male of B. pennsylvanicus usually bears a considerable amount of dull ferruginous-red pile; some of the tibia are usually more or less distinctly fringed with ferruginous hairs; the pile of scutellum often has a strong ad-
mixture of black hairs. Queens of this species have the ocelli small, placed near the supra-orbital line, above the narrowest part of the front while those of B. auricomus have the ocelli large, placed well below the supra-orbital line, in the narrowest part of the front. Queens of B. fervidus have the pleura mostly covered with light pile, while those of this species have light pile extending but a short distance below the wings. The males of B. auricomus have the ocelli large and placed well below the supra-orbital line (See Fig. 18). Their eyes bulge noticeably while the eyes of B. pennsylvanicus do not bulge much from the sides of the head and the ocelli are placed near the supra-orbital line. (See Fig. 19.) The workers of this species have the ocelli small and near the supra-orbital line while those of B. auricomus are large and well below the supra-orbital line, in the narrowest part of the front. The workers of B. fervidus and of this species are much alike except that the former species is usually considerably smaller. The scutellum of fervidus is always covered with yellow pile while that of this species usually bears all black pile, but sometimes bears black and yellow mixed, rarely all yellow.

The habitat records reported show that this species is found throughout the U. S. east of the Rocky Mountains.
Bombus auricomus (Robertson).

I have forty-four specimens of this species from Kansas before me and one worker from Magdelena Mountains, New Mexico. Besides these habitat records, the following records have been reported: New York, Massachusetts, Connecticut, Pennsylvania, Maryland, New Jersey, Delaware, Virginia, North Carolina, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Missouri, Iowa, Texas, Nebraska, Colorado, and Canada.

Of the specimens I have, thirteen are queens, twenty-five are workers, and six are males. They are not very variable. The closest ally of this species is B. nevadensis from which the females can readily be distinguished by their broad black interalar band and by having the first dorsal abdominal segment black. The males of B. auricomus have the apical segments of the abdomen black while those of nevadensis are yellow. The inner lobe of the squama is much broader and the outer lobe is much longer and more pointed at the apex in B. auricomus than in B. nevadensis.
Bombus nevadensio Cresson.

This is not a very variable species. It has been reported from Alaska, British Columbia, Washington, Montana, North Dakota, Colorado, Nebraska, Arizona, New Mexico, California, and Nevada. I am reporting it from Wyoming for the first time in this paper. I have one female taken at Rock River, Wyoming, altitude 6910 feet, and one male and seven females taken at Creede, Colorado.

In the Snow Entomological Collections, I find one female taken at Lusk, Wyoming, altitude 5017 feet, in 1895, one male and one female taken in 1894 at the Magdelena Mountains in New Mexico, one male from Estes Park, Colo., one female from Manitou Park, Colo., and one male from Colorado Springs, Colorado.

B. nevadensio is closely allied to B. auricomus (Robertson). For the distinguishing characteristics, see the discussion of that species on the preceding page.
Bombus fraternus (F. Sm.).

This is another of the Kansas species which is new to the Snow Entomological Collections. It has been reported from the following states: Texas, Louisiana, Mississippi, Georgia, Florida, Alabama, Tennessee, Arkansas, South Carolina, North Carolina, Kansas, Missouri, Kentucky, Oklahoma, Maryland, Delaware, Virginia, New Jersey, Nebraska, Illinois, Iowa, Indiana, Ohio, Colorado, Michigan, and New Mexico. It has no very close allies; B. separatus seems to be the most nearly related to it and from which it can be readily separated by the presence of a black interalar band, by the malar space of the females, which is twice as wide at its apex as it is long. The males of B. fraternus have the malar space being merely a transverse line (See Fig. 18) while the malar space of the male of B. separatus is about one-third as long as wide.

Next to B. pennsylvanicus, this species was most abundantly collected last summer in Kansas by the Kansas Entomological Expedition. Eight queens one hundred and twenty-four workers, and fifteen males were collected by the party last summer.
Bombus separatus Cresson.

I have before me only fourteen specimens of this species, all from Kansas. Five of these are queens and nine are workers—no males among them. This seems to be not a very prominent species in this part of its habitat. It is not a very variable species and has its closest ally in B. fraternus. (See discussion of B. fraternus.)

Only nine of the specimens before me were collected last summer. The species has a wide habitat, being reported from the following states: New York, New Jersey, Pennsylvania, Massachusetts, Delaware, Maryland, Rhode Island, Connecticut, Vermont, Virginia, West Virginia, Ohio, Indiana, Michigan, Illinois, Kentucky, Wisconsin, Iowa, Missouri, North Carolina, Kansas, Georgia, Florida, Minnesota, South Carolina, Mississippi, Alabama, Tennessee, Louisiana, Arkansas, North and South Dakota, Colorado, Idaho, Washington, Montana, Wyoming, Nebraska, Oregon, and Canada.
Bombus rufocinctus Cresson.

This is one of the most variable species I shall take up in this paper. The coloration is very variable. It seems to be fairly common in the western part of the United States and has been reported from California, Oregon, Washington, New Mexico, Utah, Wyoming, Arizona, Nevada, Colorado, Kansas, Montana, North Dakota, South Dakota, Minnesota, Wisconsin, Michigan, New York, Vermont; also Canada, Ontario, Lanitoba, Alberta, Saskatchewan, Assiniboia, and British Columbia.

Much difficulty has been experienced in separating this species distinctively from some of its closer allies—none of which are taken up in this paper. I have thirty-five specimens before me, most of which were collected at Beaver Creek, Montana. I have a few specimens from each of the following places: Denver, Colorado; Colorado Springs, Colorado; Southern Arizona, and Buffalo, Colorado.

The fact that this species is very variable is impressed upon me because, among the five queens, twenty-five workers, and fourteen males which I have, a large number of variations are very noticeable and many of the Color Variants described following the original description are present. The coloration of the pile covering the dorsum of the seg-
ments of the abdomen seems to be the most variable characteristic. Among the specimens of workers, which are before me, the dorsum of the second, third, and fourth segments of the abdomen has more or less ferruginous-red pile but very often it is quite varied in its location on each segment and yellow or black pile may be mixed in quite noticeably. Some of these are not described exactly by the description of the typical worker or any of the Color Variants, yet I am sure they belong to this species. For example, one worker which was collected at Creede, Colorado, has the dorsum of the first segment of the abdomen entirely covered with yellow pile; the apical half of segments two and three is covered with ferruginous-red pile and the basal half of these segments is covered with dark pile; the fourth segment is covered (except for the basal edge which is covered with dark pile) with yellow pile; segment five is covered with dark pile except for some yellow pile on the sides at the apical margin; the sixth segment is covered with dark pile. The remainder of the characteristics are the same as for the typical worker of *B. rufocinctus*, Cresson.

One of the queens which I have was referred to as being a freakish specimen when it was sent to Prof. Franklin
for determination. Accordingly, a complete description of this specimen is found on another page following this discussion. There seems to be even more variation among the males than among the queens and workers. It is only because the genitalia of the various colored males agree that many of them can be identified as belonging to this species. The males have ferruginous-red pile on some of the dorsal abdominal segments for the most part but three of the specimens before me, have the third and fourth segments covered with black pile for the most part. One very small male from Beaver Creek, Montana, has the thorax, except for the interalar band covered with very light pile. This kind of pile is also present on the abdominal segments except for the third and fourth which are mostly covered with dark pile. The size of the males varies more than the dimensions given in the original description allow. I have males varying in length from 8 mm. to 18 mm.

Bombus rufocinctus Cresson. (Original Description)

Pile short; malar space short; face usually dark; occiput yellow; legs of females dark; wings not very dark; color characters extremely variable—abdomen ferruginous and yellow, black and yellow, or black, ferruginous and
yellow; dorsum of thorax mostly yellow, but at least the disc dark.

**Queen.** Head—Broadly rounded trapeziform; face mostly black, but with a sprinkling of light pile between and above the bases of the antennae, (not very noticeable in most cases except with the aid of the lens); occiput yellow, but often with a more or less strong admixture of dark hairs; sides of head black. Labrum with tubercle-like areas well separated and with rounded margins and flat summits; shelf-like projection rather small and narrow; translucent areas faintly visible to the naked eye. Labar space considerably shorter than its width at the apex, not more than one-sixth as long as the eye. Clypeus rather sparsely and delicately punctate. Ocelli not far below the supra-orbital line, slightly above the narrowest part of the vertex. Flagellum of antennae about one and two-thirds times as long as scape; third antennal segment equal to the fourth and fifth taken together, the fifth scarcely longer than the fourth.

**Thorax.**—Dorsum sometimes with only the disc black and sometimes with a black interalar band, the remainder being covered with yellow pile; Center of disc naked, smooth and shining. Hesopleura covered usually for the most part with yellow pile, often entirely so, to the bases
of the legs, but as often with the lowest parts black, and occasionally with as much as the entire lower halves dark. Metapleura and sides of median segment sometimes entirely dark, sometimes with mixed yellow and black pile and sometimes with yellow pile only.

Abdomen.—Dorsum: segment one yellow; segment two with basal middle yellow, the rest black; segment three black; segment four with basal portion black and apical portion covered with yellow pile; segment five with considerable yellow pile on the sides, but black in the middle; segment six black. Venter mostly black, but often with a considerable sprinkling of light hairs on the apical margins of some of the segments, especially toward the sides. Epipygium with a low, rounded, longitudinal, median carina on its apical portion. Hypopygium tending to be carinate on the apical portion.

Wings.—Not very deeply stained with brown; the fore pair generally lighter across the middle portion.

Legs.—Usually all dark, but the trochanters and bases of femora often with some light pile on their lower sides.

Worker.—Much like the queen, but with lighter subhyaline wings; a black interalar band usually present; mesopleura usually entirely covered with yellow pile; metapleura
and sides of median segment usually with little other than light or yellow pile; venter tending to have rather more light pile on apical portion than in case of queen.

Male.-- Head. Broadly rounded trapeziform. Face with a patch of usually strong yellow pile running from the bases of the antennae down over the clypeus, sometimes, however, with a strong admixture of dark hairs; above the bases of the antennae sometimes black and sometimes with a tuft of yellow hair. Occiput yellow; sides of head behind the eyes sometimes entirely dark, but usually with more or less yellow pile connecting with the yellow on the occiput. Malar space not more than half as long as its width at its apex. Clypeus usually mostly covered up with pile. Eyes somewhat swollen and bulging out from sides of head. Ocelli placed at not more than one-fourth of the distance from the supra-orbital line toward the bases of the antennae. Each lateral ocellus separated from the margin of the eye by about its own diameter. Flagellum of antennae a little less than three times as long as the scape; third antennal segment about equal to the fifth, the fourth shorter than either.

Thorax.-- Front part of dorsum and scutellum covered with yellow pile. A broad black interalar band usually present but often partly or entirely obliterated, the whole
dorsum then being yellow. Lesopleura covered with yellow pile to the bases of the legs. Metapleura and sides of median segment with mostly yellow pile, but often with some dark hair.

**Abdomen.**—Dorsum: segments one and two covered with yellow pile; segments three and four covered with ferruginous pile; segments five, six, and seven covered with yellow, but often with an admixture of black or ferruginous hairs. Venter very variable, sometimes mostly black and sometimes with mostly light pile, but always with the apical margins of the segments fringed more or less with light pile.

**Genitalia.**—(See Figures 27, 29, 31, and 40.) Outer spatha short and broad; the anterior margin deeply incurved; anterior lateral projections rounded at their sides; side margins nearly straight; posterior margin broadly, but not deeply, incurved at the middle; apical portion of ventral surface scattered over with hairs, these being longest on the sides. Inner spatha with anterior margin, except median projection, straight; the lateral margins converging sharply towards each other; apex narrow and rounded and bearing rather dense hair on its ventral surface; a single median fenestra of varying shape usually present. Claspers with branches rather narrow toward the
tip and rounded at the end as viewed from dorsal side; volsella of nearly even width throughout, but narrowing near their ends to pointed tips and extending far beyond the tips of the squama; squama with the two lobes pointed and nearly equal. Sagittae with shafts bent outward, somewhat in the middle and heads very irregularly sickle-shaped, the tips appearing narrow and pointed. Uncus very broad at base and tapering somewhat rapidly to its rounded tip. **Wings.**—About like those of workers.

**Legs.**—Coxae entirely black, but usually with some yellow hair; trochanters with more or less yellow pile on their lower sides; femora with considerable yellow hair; fore and middle tibia black; posterior tibia with outer faces convex, naked and shining, with front fringes short and black, and hind fringes long and sometimes entirely black, but often more or less strongly ferruginous. Posterior metatarsi about two and one-half times as long as their greatest width; with moderately long hind fringes, sometimes black and sometimes more or less ferruginous; their outer face concave and rather sparsely pubescent.

**Dimensions.**—Length: Queen, 14 mm. to 16 mm.; worker, 8 mm. to 13 mm.; male, 10 mm. to 15 mm. Spread of wings; queen, 31 mm. to 36 mm.; worker, 18 mm. to 31 mm.;
male, 22 mm. to 31 mm.; width of abdomen at second segment:
queen, 8 mm. to 8½ mm.; worker, 4 mm. to 7 mm.; male,
5¾ mm. to 7 mm.

**Color Variant 1.**—Queen and worker like typical form,
but with abdomen entirely black except for the first and
basal middle of the second dorsal segments which are yellow.

**Color Variant 2.**—The typical form of queen and
worker described above.

**Color Variant 3.**—Queen and worker like the typical
form, but with the apical portion of the third dorsal ab-
dominal segment more or less ferruginous and the fourth
dorsal abdominal segment entirely yellow.

**Color Variant 4.**—Queen and worker like Color Variant
3, but with the second dorsal abdominal segment, except
the yellow basal middle, and the third dorsal segment,
entirely covered with ferruginous pile.

**Color Variant 5.**—Queen like that of Color Variant
4, but with the first dorsal abdominal segment and the
basal middle of the segment also entirely ferruginous, thus
making the three basal dorsal abdominal segments entirely
ferruginous.

**Color Variant 6.**—Queen and worker like those of
Color Variant 4, but with the fourth dorsal abdominal seg-
ment entirely ferruginous, and the fifth entirely black or with touches of ferruginous on the sides.

**Color Variant 7.**— Queen and worker like the typical form, but with the face bearing a more or less noticeable amount of yellow pile, pleura yellow to the bases of legs, second dorsal abdominal segment entirely covered with yellow, fifth segment entirely yellow and hind trochanters and femora bearing considerable yellow pile.

**Male Color Variant 1.**— Like the typical form described above, but with the fourth dorsal abdominal segment yellow instead of ferruginous.

**Male Color Variant 2.**— Like the typical form but with the seventh dorsal abdominal segment entirely clothed with ferruginous pile.

**Male Color Variant 3.**— The typical form described above.

**Male Color Variant 4.**— Like the typical form, but with all the dorsal abdominal segments after the first two entirely covered with ferruginous pile.

**Male Color Variant 5.**— Like the typical form, but with the dorsum of the abdomen mostly yellow, sometimes with slight touches of black or ferruginous on the apical half.

**Male Color Variant 6.**— Like the typical form, but with all the dorsal abdominal segments after the first two
entirely dark.

Male Color Variant 7.— Like the typical form, but with the fourth dorsal abdominal segment yellow, and the fifth, sixth, and seventh light ferruginous.

Male Color Variant 8.— Like Male Color Variant 1, but with the third dorsal abdominal segment black instead of ferruginous, and the pile on the apical segments more whitish on the dorsal side.

Male Color Variant 9.— Like Male Color Variant 8, but with the fourth and seventh dorsal abdominal segments black.

l. c. Franklin.

Bombus rufocinctus Cresson. (Freakish Specimen).

Female. Head. Broadly rounded trapeziform; face mostly black, but with a sprinkling of light pile between and above the bases of the antennae (this is only seen upon close observation); occiput yellow, but with a more or less strong admixture of black hairs; sides of head black. Labrum with tubercle-like areas well separated and with rounded margins and flat summits; shelf-like projection rather small and narrow; translucent areas faintly visible to the naked eye. Lalar space considerably shorter than
its width at apex; not more than one-sixth as long as the eye. Clypeus rather sparsely and delicately punctate. Ocelli not far below the supra-orbital line, slightly above the narrowest part of the vertex. Flagellum of antennae about twice as long as the scape; third antennal segment equal to fourth and fifth taken together, the fifth scarcely any longer than the fourth.

Thorax.— Dorsum of thorax with a black inter-alar band, the remainder being covered with yellowish ferruginous and light pile. Center of disc naked, smooth and shining. Mesopleura covered for the most part with yellow pile, entirely to the bases of the legs. Metapleura and sides of median segment quite dark with mixed yellow and black pile.

Abdomen.— Dorsum: segment one light yellow except the central third which is dark, nearly black; segment two and three pale ferruginous yellow with a dark triangle on these two segments on the center— the base of the triangle is at the base of segment two and the apex is at the apex of segment three; segment four a light yellow with a ferruginous tinge; segment five with considerable yellow pile on the sides but dark in the middle; segment six dark. Venter mostly dark, the sides having a sprinkling of light hairs and the apical margins of the segments have a con-
considerable sprinkling of light hairs. Epipygium with a low rounded, longitudinal, median carina on its apical portion. Hypopygium tending to be carinate on apical portion.

Wings. — Not very deeply stained with brown.

Legs. — Hind legs dark but trochanters and femora of fore and middle legs have some light pile on their lower sides.

Dimensions: — Length: 17 mm. Width of abdomen at second segment: 9 mm. Spread of wings, 32 mm.

Habitat: Beaver Creek, Mont. alt. 6300 feet.
*Psithyrus insularis* (F. Sm.)

This species was found to be comparatively rare. I have only eight specimens before me, three of which have been in the Snow Entomological Collections for sometime. It is very closely related to other forms of *Psithyrus*. Of those mentioned in this paper it is most closely related to *P. variabilis* from which it can be separated by its difference in the coloration of its metapleura.

According to Prof. Franklin this species is the female of *P. consultus* which he first describes as a new species in his paper on "The Bombidae of the New World." I am therefore including the description of *consultus* as the male of *insularis*. The specimens before me came from Beaver Creek, Montana, and Creede, Colorado. One of the specimens from Montana, when sent to Prof. Franklin for determination, was called a freak by him. For this reason a complete description of this specimen is included in this paper following the original description.

Other specimens before me are one female from each of the following places: Manitou Park, Colo., Magdelena Mountains, New Mexico, Southern Arizona. The specimen from Arizona was taken in 1902 by Dr. F. H. Snow and determined by H. L. Vierick. This is the first time it has
been reported from Arizona. The following habitat records had been reported: Colorado, Oregon, Nebraska, Utah, North Dakota, New Mexico, Montana, Washington, New Hampshire, New York, Quebec, British Columbia, Alberta. It is probably present in a large number of places from which it has not yet been reported.

_Psithyrus insularis_ (F. Sm.). (Original description.)

Face usually with more or less yellow pile between and above the bases of the antennae; occiput with much yellow pile; dorsum of thorax yellow, but with a black interalar band or at least the disc black; pleura mostly yellow to the bases of the legs; dorsum of abdomen black, with more or less yellow on the sides of the third, fourth, and fifth segments, and sometimes a little on the hind corners of the second. Venter and legs dark. Malar space rather long. Hind metatarsi narrow for their length.

**Female. Head.**—Face usually with considerable yellow pile above, and usually with a distinct tuft of yellow between, the bases of the antennae, but sometimes almost entirely black; occiput with a large triangular patch of pure yellow pile; cheeks dark. Mandibles sometimes with apical margin entire and sometimes with a notch in its middle. Malar space shorter than its width at apex, about one-fourth
as long as the eye. Clypeus with anterior portion sparsely punctate in the middle, the remainder being coarsely and densely punctate. Flagellum of antennae nearly one and four-fifths as long as the scape; third and fifth antennal segments subequal in length, the fourth much shorter than either.

Thorax.-- Dorsum yellow, usually with a distinct, though often poorly defined, black band between the bases of the wings; sometimes all yellow except for a large black spot on the disc. Mesopleura covered with yellow pile to, or nearly to, the bases of the legs; metapleura very often entirely dark, but usually with considerable yellow pile; sides of the median segment and metanotum usually entirely dark, but sometimes with some yellow pile.

Abdomen. Tergum: segment one usually entirely dark, but occasionally with a touch of yellow on its anterior corners, or even on its middle portion; segment two usually entirely dark, but often with more or less yellow on the sides of its hind border; segment three black in the middle, the sides being entirely covered with yellow pile, or at least with yellow on their hind portions; segments four and five usually dark in the middle and with yellow pile on the sides, the latter, however, sometimes entirely or
almost entirely dark. Segment six dark, but usually with ferruginous pubescence running back from the apex considerably on each side. Venter dark, but with considerable brownish-ferruginous pubescence on the apical portion of the apical segment. Lateral carina of hypopygium much less elevated and with their front portions more rounded, than those of latitarsus, their hind portions distinctly and somewhat suddenly lower than their front portions.

Wings.—Moderately stained with brown; the fore pair usually darkest in the region beyond the veins.

Legs.—Dark. Sarothri about three times as long as their greatest breadth, their posterior margins nearly straight.

Dimensions: Female: length, 13½ mm. to 18 mm.; spread of wings, 32 mm. to 38 mm.; width of abdomen at second segment, 7 mm. to 9 mm.

Hale. Head.—Face usually with a distinct, though sometimes faint, tuft of yellow above the bases of the antennae, and also sometimes with a few yellow hairs between the bases of the antennae; otherwise entirely dark; occiput with a large triangular patch of yellow pile; cheeks dark. Labral space shorter than its width at the apex, about one-sixth as long as the eye. Clypeus clothed with black pile.
Flagellum of antennae about three and one-third times as long as the scape; the fifth antennal segment much longer than the third, the third much longer than the fourth.

**Thorax.**-- Dorsum yellow, with (rarely without) a black band between the bases of the wings, this band being rather poorly defined, and very often extending back, in the middle onto the middle of the scutellum; mesopleura mostly covered with yellow pile to the bases of the legs; metapleura variable, sometimes with mostly dark and sometimes with mostly yellow pile; sides of the median segment mostly dark.

**Abdomen.**-- Dorsum: segment one yellow; segment two yellow, but often with more or less black pile on each anterior corner; segment three yellow; segment four sometimes mostly covered with yellow pile, but usually more or less black in the middle and sometimes with yellow only on the extreme sides; segment five sometimes mostly black, but usually black in the middle with yellow on the extreme sides; segment six usually entirely or almost entirely black, but often with a little yellow pile on the extreme sides; segment seven dark. Venter dark in the middle, but usually with considerable yellow hair on the sides.

**Genitalia.**-- Outer and inner spathae much like those
of laboriosus. Claspers with their branches broadly rounded at the end as viewed from dorsal side. Sagittae like those of variabilis. (See Fig. 33.)

Wings. — Somewhat stained with brown; the fore usually darkest in the region beyond the veins.

Legs. — Mostly black; the tarsi with more or less ferruginous hair.

Dimensions. — Length, 10 mm. to 14 mm.; spread of wings, 23 mm. to 30 mm.; width of abdomen at second segment, 4½ mm. to 6 mm.

l. c. Franklin.

Psithyrus insularis (F. Sm.) (Freakish Specimen).

Female. Head. — Face with considerable yellow pile above, and with a distinct tuft of yellow between, the bases of the antennae. Occiput with quite a patch of yellow pile; cheeks dark. Mandible with the apical margin with a notch in its middle; malar space slightly wider at its apex than it is long, about one-fourth as long as the eye. Clypeus with its anterior portion sparsely punctate in the middle, the remainder being coarsely and densely punctate. Scape of antennae just a little more than half as long as the flagellum. Third and fifth antennal segments subequal in length, the fourth is shorter than either.
Thorax.— Dorsum of thorax yellow with a large black spot on the disc and only the sides of the scutellum covered with yellow pile. Mesopleura covered with yellow pile very nearly to the bases of the legs. Metapleura entirely dark; sides of median segment and metanotum entirely dark.

Abdomen.— Tergum: segments one and two entirely black; segments three and four black with only a slight sprinkling of yellow hairs on the apical margins and on the sides of these segments; segments five and six entirely black. Venter entirely dark. Lateral carina of hypopygium little elevated and with rounded front portions and hind portions distinctly and somewhat suddenly lower than their front portions.

Wings.— Moderately brown and lighter in the region beyond the veins.

Legs.— Dark. Sarothri about three times as long as their greatest breadth, their posterior margins nearly straight.

Dimensions.— Length, 17 mm. Width of abdomen at second segment, 9 mm. Spread of wings, 36 mm.

Habitat.— Beaver Creek, Montana, 6300 feet elevation.
Psithyrus consultus Franklin.

This species is now called the male of the species, Psithyrus insularis (F., Sm.), because since naming it P. consultus further proof has been established which it is the male of the first named species. The structure and further established habitat records of this species have been the deciding factors in calling it P. insularis.

It has been found in British Columbia, Alberta, Utah, Colorado, Montana, Washington, New Mexico, and North Dakota. I have about forty specimens from Beaver Creek, Montana, and Creede, Colo. There are also in the Snow Entomological Collections two cotypes of this species from Magdelenas Mountains, New Mexico, and Manitou Park, Colo., collected by F. H. Snow and determined by Prof. H. J. Franklin. The species is not very variable. The original description is included under the discussion of P. insularis.
This is not a very variable species, but has very close allies in *P. variabilis* and *P. insularis* for which reason I am including the original description. It has been reported from Kansas, Texas, Alabama, Nebraska, Mexico, and New Mexico. I have before me two specimens from Kansas and two from Texas which were in the Snow Entomological Collections and also six females and three males which were collected by R. H. Beamer in Kansas last summer.

Females of *P. variabilis* are separated from *insularis* by having the metapleura bearing dark brown or black pile while *P. insularis* has light or yellow pile on the metapleura. The same characteristic distinguishes the males of these species from each other.

**Psithyrus variabilis** (Cress.) D. T.

Occiput with a large triangular patch of yellow pile. Dorsum of thorax being rather dull yellow pile before and behind, with a black interalar band or with only the disc dark. Pleura dark. Abdomen of female entirely dark; that of male quite variable. Wings rather dark brown. Malar space of female distinctly shorter than its width at apex.
Female. Head.-- Face often with a sprinkling of yellow hairs above the bases of the antennae; otherwise dark, except for a large triangular patch of yellow pile on the occiput and even this yellow patch usually with at least a slight admixture of dark hairs. Malar space somewhat shorter than its width at the apex, about one-fourth as long as the eye. Clypeus coarsely punctate. Flagellum of antennae about one and four-fifths times as long as the scape; third and fifth antennal segments subequal in length, the fourth distinctly shorter than either.

Thorax.-- Dorsum mostly covered with yellow pile. The disc, between the bases of the wings, always dark and thinly clothed, this dark and thinly clothed area extending back on to the scutellum in the middle. The dark color of the hair on the disc often extending to the base of the wing on each side so as to form a poorly defined interalar band. Mesopleura entirely covered with dark pile from slightly below the level of the bases of the wings. Metapleura and sides of median segment dark.

Abdomen.-- Dorsum and venter dark, except for brownish ferruginous pubescence on the apex of the last segment.

Wings.--Rather dark brown; the fore pair usually lightest across their middle portions.
Legs.— Dark. Hind metatarsi much as in insularis.  

Male. Head.— Dark, except for a triangular patch of yellow pile on the occiput, this patch with at most only a slight admixture of dark hairs. Malar space shorter than its width at the apex, about one-fifth as long as the eye. Clypeus covered with black pile. Flagellum of antennae about three and one-fourth times as long as the scape; fifth antennal segment much longer than the third; the third longer than the fourth.

Thorax.— Dorsum with pile colored much like that of queen, but usually with a distinct black band between the bases of the wings. Mesopleura usually about like those of the queen, but with the yellow pile sometimes running down for some distance below the bases of the wings. Pile of metapleura and sides of median segment dark.

Abdomen.— Dorsum: segment one usually entirely dark, but often with a more or less strong admixture of yellow hairs especially towards the sides; segment two usually entirely dark, but occasionally with a touch of light pile near the hind margin on the sides; segment three mostly dark, but with considerable yellow pile on the sides, especially on the posterior corners, with a strong tendency to reach out from these corners along the hind margin.
toward the middle line of the segment and occasionally bordering this margin all the way across; segment four usually mostly dark with yellow pile on the extreme sides, but sometimes with the yellow pile also extending in toward the middle of the segment on each side, especially along the hind border; segment five mostly dark, usually with more or less yellow pile on the extreme sides; segment six dark, sometimes with a touch of yellow on the extreme sides; segment seven dark. Venter mostly dark.

Genitalia.-- (See Figures 28, 33, 34, and 36.)

Outer spatha with its anterior lateral projections very long and narrow, its anterior margin being sharply and evenly incurved; side broadly and gradually outcurved; hind margins usually somewhat irregularly, but not very strongly, trilobate; hind portion of ventral surface bearing long branched hairs, especially toward the sides and toward the hind margin; a small fenestra usually present, placed on the middle line, some little distance back from the anterior line. Inner spatha with its anterior margin projecting forward strongly in the middle, the projection being heavily chitinized; the side margins very abruptly bent inward in front, their posterior portions nearly straight and approaching each other very grad-
ually toward the broadly rounded tip; apical portion of the ventral surface thickly covered with branching hairs; a large oval fenestra present in the middle, and usually a small one on each side, placed well out in the lateral projection. Clasper with branch of good width, its apex being broadly rounded; squama very strongly bilobed, the inner lobe comparatively large and prominent and bearing a very heavy brush of branching hairs, and the outer lobe often pointed and slightly hooked at the tip; volsella pointed with the posterior half of its inner margin broadly though not very deeply, incurved. Sagitta with a rather long narrow shaft and foliaceous recurved head.

Wings.—Somewhat stained with brown; somewhat lighter than those of the female.

Legs.—Dark; the tarsi more or less ferruginous.

Dimensions.—Length: female, 16 mm. to 18 mm.; male, 13 mm. to 17 mm. Spread of wings: female, 38 mm. to 41 mm.; male, 35 mm. to 38 mm. Width of abdomen at second segment: female, 7½ mm. to 9 mm.; male, 5½ mm. to 7 mm.

l. c. Franklin.
Psithyrus latitarsus Morrill.

This species is undoubtedly comparatively rare. It is a pretty strictly Boreal form. I have only one specimen which is a female taken at Creede, Colorado, altitude of 8844 feet, and a new habitat record for the species. It has been reported from Washington, Montana, and British Columbia. The closest ally of this species which is taken up in this paper is P. insularis, which it resembles very much in coloration but has a longer malar space than P. latitarsus. The former also has more narrow hind metatarsi and less prominent elevations on its hypopygium.

Prof. Franklin thinks that P. latitarsus is the female of P. suckleyi (Greene) because, as shown by coloration and structure, both are mostly allied to the female and male of Psithyrus ashtoni respectively. Their known habitats are also nearly the same. This species is new to the Snow Entomological Collections.

Psithyrus latitarsus Morrill. (Original Description)

Head mostly black. Dorsum of thorax yellow, but usually with a distinct black band between the bases of the wings; pleura yellow to the bases of the legs. Dorsum
of abdomen with segment one usually having a slight touch of yellow on its anterior corners, but often entirely dark; segment two dark; segment three dark but usually with yellow pile on its posterior corners; segment four dark in the middle and yellow on the sides; segment five dark but usually yellow on the extreme sides; segment six, venter and legs dark. Malar space medium. Hind metatarsi broad. Lateral elevations of hypopygium very prominent.

Female. Head.—Often entirely dark; the occiput usually with a faint sprinkling of yellow hairs. Mandibles usually with their biting margin slightly notched on the middle. Malar space shorter than its width at the apex, about one-fifth as long as the eye. Clypeus, for the most part, densely and coarsely punctate. Flagellum of antennae about one and three-fourths times as long as the scape; the third antennal segment longer than the fifth, the fifth longer than the fourth.

Thorax.—Dorsum yellow, usually with a distinct, but rather poorly defined, black band between the bases of the wings, this band occasionally partly or entirely obliterated on the sides, leaving only a black spot on the disc. The center of the disc bare. Mesopleura covered with yellow pile to, or very nearly to, the bases of the legs; metapleura
with considerable yellow pile; sides of the median segment mostly dark.

**Abdomen.**— Dorsum: segment one dark, but usually with a slight touch of yellow on its hind corners; segment four dark on the middle (at least on the basal middle) and with yellow pile on the sides; segment five mostly dark, but with yellow pile on the extreme sides; segment six dark, but each side with a broad and somewhat indefinite, but distinctive, line of brownish pubescence. Venter dark, the apical portion of the apical segment with considerable brownish pubescence. Each side of the hypopygium with a very strongly elevated and angular process or carina, visible even from the dorsal side, the two carinae converging posteriorly, becoming less pronounced and disappearing near the tips of the segment.

**Wings.**— Somewhat stained with brown, but not strongly so.

**Legs.**— Entirely dark. Length of hind metatarsus about two and one-half times its greatest width, its posterior edge strongly arcuated.

**Dimensions:** Length, 15 mm. to 19 mm. Spread of wings, 35 mm. to 42 mm. Width of abdomen at second segment, 8½ mm. to 9½ mm.

l. c. Franklin.
Psithyrus suckleyi (Greene).

This is the first time this species has been reported from Colorado. I have about forty specimens, all males, before me. Habitat records reported before this were as follows: California, Montana, Idaho, Utah, Alberta, and British Columbia. It is mainly a Boreal form. Prof. Franklin believes the female of this species to be P. latitarsus as described on another page preceding this discussion. His reasons for believing this are also given under the discussion of P. latitarsus.

The males of this species are not very closely allied to any other species which I have before me. It is a new species to the F. H. Snow Entomological Collections. The variations in color of the scutellum and pleura are not very great, however there is a variation in the relative amount or prominence of color in the various individuals. Greater variation takes place in the coloration, and the amount of it, on the abdominal segments. Some of the specimens have a much stronger coloration of yellow pile than others.

Psithyrus suckleyi (Greene). (Original description).

Face dark; occiput with considerable yellow pile; cheeks dark; dorsum of thorax yellow, with a narrow black
Interalar band; pleura yellow; dorsum of abdomen yellow with first segment yellow, second segment dark on the sides and usually along the apical margin, but yellow in the middle, at least on the basal portion, third segment sometimes entirely yellow, except for dark on the anterior corners, and sometimes dark in the middle and along the front margin; also, fourth segment mostly yellow, fifth and sixth segments dark in the middle and yellow on the sides, seventh segment dark; venter dark in the middle, with considerable yellow hair on the sides; legs mostly dark.

**Males. Head.**—Face black often with an admixture of yellow hairs above the bases of the antennae; occiput with a triangular patch of yellow pile, often with dark hairs admixed; cheeks dark. Malar space shorter than its width at the apex, hardly one-fifth as long as the eye. Clypeus clothed with black pile. Flagellum of antennae nearly three times as long as the scape; third and fifth antennal segments subequal in length, the fourth distinctly shorter than either.

**Thorax.**—Dorsum yellow, with a narrow and rather poorly defined black band between the bases of the wings; mesopleura mostly covered with yellow pile to the bases of the legs; metapleura with considerable yellow pile; sides
of median segment mostly dark, but often with considerable light hair admixed.

Abdomen.-- Dorsum: segment one yellow; segment two yellow in the middle and dark on the sides, often dark also along the apical border; segment three usually with mostly yellow pile, but usually with a strong admixture of dark hairs, especially in the middle, and with a black touch on each anterior corner; segment four mostly yellow; segment five more or less black in the middle, with yellow pile on the sides; segment six black in the middle and yellow on the extreme sides; segment seven black. Venter usually with a large amount of yellow pile, especially on the sides; the apex of the last segment bearing ferruginous pubescence.

Genitalia.-- Outer spatha long for its width; its anterior margin broadly but deeply incurved, its side margins nearly straight and converging posteriorly and its hind margin arcuate; each anterior lateral projection with a small pointed projection on its outer side near the end; ventral surface with a scattering tuft of very long hairs on each side of the middle. (See Figures 32 and 35.) Inner spatha long for its width, its front margin projecting forward strongly and heavily chitinized in the middle; its side margins sharply incurved in front and outcurved
behind; its hind margin curved forward somewhat in the middle so as to make the apex feebly bilobate; the apical portion of the ventral surface, except along the middle line, rather densely clothed with long branched hairs. Claspers with branches slender and rounded at the apex as seen from dorsal side; each squama with its margin outcurved on its outer side and at its apex, but somewhat incurved on the inner side of its apical portion; each volsella more or less pointed at its apex, its outer margin outcurved and its inner margin usually somewhat outcurved behind the middle, but strongly incurved in front. Sagitta with a rather long narrow shaft and foliaceous head which is recurved.

**Wings.**—Somewhat stained with brown, almost subhyaline.

**Legs.**—Mostly dark; the tarsi often with considerable, and the tibia sometimes with more or less, ferruginous hair.

**Dimensions.**—Length, 13 mm. to 14 mm. Spread of wings, about 32 mm. to 34 mm. Width of abdomen at second segment, about $6\frac{1}{2}$ mm.

l. c. Franklin.
SUMMARY

Twenty-five species of Bombidae have been discussed under the heads of two genera, Bombus and Psithyrus. The following is a list of the specimens studied:

Bombus occidentalis Greene.........................115.
  " var. nigroscutatus.........................26.
  " appositus Cresson.........................115.
  " kirbyellus Curtis.........................4.
  " bimaculatus Cresson.........................2.
  " huntii Greene.........................36.
  " edwardsii Cresson.........................419.
  " melanopygus Nylander.........................29.
  " flavifrons Cresson.........................42.
  " centralis Cresson.........................82.
  " mixtus Cresson.........................4.
  " fervidus F.........................25.
  " fervidus var. dorsalis F.........................16.
  " californicus F. Sm.........................6.
  " pennsylvanicus De Geer.........................273.
  " auricomus (Robertson).........................45.
  " nevadensis (Cresson).........................15.
  " fraternus (F. Sm.).........................147.
  " separatus Cresson.........................14.
The following new habitat records are reported from the specimens studied above:


2. Bombus melanopygus Nylander. Beaver Creek, Montana, 6300 feet alt., one male and six workers (S. J. Hunter).


5. Bombus bimaculatus Cresson. Lawrence, Kansas, 900 feet alt., one female (R. H. Beamer.) Riley County, Kansas, one female (Marlatt).


7. Psithyrus suckleyi (Greene). Creede, Colorado, 8844
feet alt., forty males (S. J. Hunter).


The following species, ten in number, were added to The Francis Huntington Snow Entomological Collections as new species to these collections:

Bombus occidentalis Greene.

'' var. nigroscutatus Greene.

'' bimaculatus Cresson.

'' edwardsii Cresson.

'' huntii Greene.

'' mixtus Cresson.

'' fraternus (F. Sm.)

'' kirbyellus Curtis.

Psithyrus latitarsus Morrill.

'' suckleyi (Greene).

Occasional freakish specimens were found and complete descriptions of these were given under the discussion of the species to which they belong. The following species contain such descriptions: B. edwardsii, B. huntii, B. rufocinctus, and P. insularis. Four specimens of B. edwardsii, when sent to Prof. H. J. Franklin for determination, were found to represent two new color variants of
of that species. Complete descriptions of those specimens are included in this paper.

These species were found to be the most variable in the order named: B. rufocinctus, B. californicus, B. occidentalis, and B. edwardsii. Variations are greatest in the coloration of the pile, especially of the pile which covers the dorsal abdominal segments. The apical segments are most constant in coloration, and the basal segments are more constant than the middle ones. Structurally, the malar space varies more within the species than any other one characteristic. Northern specimens of some species were found to be darker in coloration, as a rule, than the more southern specimens of the same species.

A large nest of B. edwardsii was found in Colorado in 1914. Notes on the biology of this species were obtained from the nest, which contained two hundred fifty specimens and was remarkable mainly for its location. The economic importance and life-history of the bumblebee is given at the beginning of this paper.
GLOSSARY

The following glossary of terms aims to contain an explanation of technical terms as they are used in this paper; hence the definitions given pertain to the meaning of the terms as they refer to the Bombidae, only. These explanations are necessary, primarily, because many terms used in the description of Bombidae do not have the same meaning as when used in describing other families of insects. The following books were used in making this glossary:

Explanation of Terms Used in Entomology.
John B. Smith. 1906.

Studies in North American Bees I.
Myron H. Swenk. 1912.

The Bombidae of the New World.
Henry J. Franklin. 1913.

New Standard Dictionary of the English Language.
Funk & Wagnall. 1913.
abdomen.-- third or posterior division of the body; female abdomen contains six segments and male abdomen abdomen contains seven segments.

anal vein.-- hind border of submedian cell of hind wing.

antennae cleaner.-- a fringed excavation on the interior base of the first segment of the anterior tarsi which, when covered by the movable process from the end of the tibia forms an opening through which the antennae may be drawn.

apical cell.-- a cell near or at the apex of the wing. (See Fig. 3.)

Austral.-- of or pertaining to southern or comparatively low regions.

apical projection.-- a conspicuous, pointed, ventrally recurved projection on the dorsal and inner side of the apex of the volsellae. Absent in Psithyrus.

basal vein.-- the slanting distal boundary of the median cell of the forewing. (See Fig 3).

bifid.-- divided into two parts, split.

Bombus.-- the name of a genus of the Bombidae.

Boreal.-- of or pertaining to northerly and mountainous regions.

branch.-- a part of clasper of male genitalia; a large smooth basal and lateral piece reaching the middle line on the ventral side and connecting with the corresponding part of the other clasper. (See Fig. 33).

bulb.-- a prominent and elongate basal swelling of the sheath and containing a large cavity.

castes.-- the different forms of matured individuals; as workers, queens, and males.

cardo.-- a part of male genitalia; smooth and without hair, single large, dorsal, basal sclerite providing most of the attachment for the genitalia to the rest of the abdomen. (See Fig. 37, C.)
carina.— an elevated ridge or keel.

chitinous.— like chitin, which is the material that forms the hard part of the body.

clasper.— a lateral muscular organ on each side in male genitalia; it is made up of branch or stipes, squama, and volsella or lacinia. (See Fig. 37, CL.)

claw.— hooklike structures at the end of the tarsus. Fig. 10.

clypeus.— the portion of the head below the front to which the labrum is attached anteriorly.

corneus.— of a horny or chitinous substance.

corbiculae.— a concave smooth space on the outer side of the posterior tibia; it is edged by a fringe of hairs arising from the margins of the tibia; sometimes called the pollen basket.

corbicular fringe.— the bordering fringe of the corbiculae.

costal cell.— the anterior closed cell of the hind wing. it is elongate and basal. (See Fig. 3.)

Costal vein.— the front border of the costal cell of the hind wing. (See Fig. 3.)

cotype.— a specimen of the original series chosen after publication to take the place of a type as the standard of reference.

couvercle genital.— the inner and outer spathae taken together. (See Fig. 24.)

coxae.— the basal segment of the legs, by means of which it is articulated to the body. (See Fig. 14.)

cubital cells— the three cells bordered in front by the costal cell, the radial cell and the weak stigma, and behind by the first and third discoidal and the second apical cells. (See Fig. 3.)

cubital vein.— the vein between the cubital cells. (See Fig. 3)

darts.— the two long slender ventral pieces of the sheath, sometimes called lancets.
disc. — the central upper surface of the thorax.
discoidal cells. — the cells immediately behind the cubitals in the fore wing. (See Fig. 3.)
discoidal vein. — the vein separating the first and third discoidal cells. (See Fig. 3.)
distal. — the part fartherest from the base.
dorsum. — the upper surface.
epimeron. — the posterior lateral sclerite of the thorax.
epipygium. — the last exposed tergum of the abdomen.
episternum. — the anterior and larger lateral thoracic sclerite between the sternum and notum.
face. — the space between the eyes to the base of the antennae.
femora. — the largest segment of the leg; articulated to the body by the trochanter and coxae, and bearing the tibia at its distal end. (See Fig. 14.)
fenestra. — a translucent glassy spot or mark on the inner spatha. (See Fig. 28, f.)
ferruginous. — rusty, red-brown.
filiform. — slender, thread-like, and of equal diameter.
flagellum. — the part of the antennae beyond the pedicel. (See Fig. 9, FL.)
fore wings. — anterior wings. (See Figures 3, 4, 5, & 5a.)
freak specimen. — sports or specimens which have uncommon abnormalities.
frenal fold. — a downward fold of the wing membrane at the hind margin of the forewing; it serves as a place of attachment for the frenal hooks on the front margin of the hind wing.
frons. — the space on the head extending from the vertex to the clypeus, and also in the triangular extensions,
down on each side of the clypeus to the malar space.

front.-- the anterior part of the head between the bases of the antennae and the ocelli.

genae.-- the cheeks; space behind the eyes along the sides of the head.

geniculated.-- abruptly bent in an obtuse angle.

Genital guides.-- lobes at the inner margin of each of the basal arms of the sheath of the sting; they serve to guide the heads of the sagittae to the mouth of the vagina.

Habitat.-- the locality where a specimen is collected.

head.-- anterior region of the body; also the modified terminal portion of the sagittae of male genitalia.

(See Fig. 39, H.)

Homotype.-- a specimen, preferably a topotype, identified as identical after comparison with the type, allotype, or lectotype by a taxonomist other than the original describer of the species.

Hyaline.-- transparent or partly so; vitreous.

Hypopygium.-- the last exposed sternum of the abdomen; in the males it is the sixth exposed sternum.

Inner spatha.-- a part of male genitalia; a ventral basal foliaceous sclerite roughly triangular in outline and always has its anterior margin thickened and extended forward prominently in the middle and usually with at least one fenestra. (See Fig. 55 or 59.)

Integument.-- the outer covering of the body.

Inquiline.-- a species living in a structure prepared by a different species, not as a parasite but as a guest.

Interalar band.-- a transverse band of differently colored pile on the thorax between the wings.
labrum.— the upper lip.
lacinia.— See volsella.
lancets.— see darts.

lecto-type.— a specimen of a cotypic series chosen after publication to take the place of a type as the standard of reference.

malar space.— the smooth space without hair between the lower end of the eye and the base of the mandible on each side of the head. (See Fig. 11, 12.)

male.— the sex having organs for the production of spermatozoa; they are of no other use to the colony.

mandibles.— lateral upper jaws for biting. (See Fig. 23.)

median basal plate.— a chitinous plate running from the middle of the wing base back beyond the hind margin of the base; it is elongate rounded in front and pointed behind.

median carina.— a ridge or projection on the middle of the hypopygium of the females of Bombus.

median cell.— the largest cell of the hind wing; it is widest in the middle and tapers toward both sides. (Fig. 6.)

median vein.— the vein which separates the median cell from the submedian cell in the hind wing. (See Fig. 6.)

mesonotum.— the upper surface of the second or middle thoracic ring.

mesopleura.— the lateral surfaces of the mesothorax.

mesothorax.— second thoracic ring which bears the middle legs and anterior wings.

metanotum.— the upper surface of the metathorax.

metapleura.— the lateral surfaces of the metathorax.

metatarsus.— the basal joint of tarsus.
metathorax.— the third segment of the thorax; it bears the hind legs and wings.

metatype.— a specimen, preferably a topotype, identified as identical after comparison with the type, allotype, or lectotype by the original describer of the species.

mouth.— anterior opening into the alimentary canal.

nux.— a small piece which is largely enclosed by the branch on the ventral side at the base of each volsella.

occiput.— the part of the head between the vertex and the neck.

ocellus.— a simple eye which consists of a single convex lens which conveys an image to a retina.

outer spatha.— a part of male genitalia; a large ventral, basal foliaceous sclerite with anterior margin curved far backward into the middle and is usually without fenestrae; more or less hair on apical portions of their outer surfaces. (See Fig. 36.)

palpus plate.— a paired plate attached to and overlapping the base of the sting.

pedicel.— the second joint of the antennae.

penis.— a flexible membranous organ retracted under the base of the uncus.

pile.— a hairy or fur-like covering.

pilose.— covered with soft down or hair; pile.

poisen canal.— the cavity of the sheath bulb which continues through the entire length of the shaft of the sting as a channel.

planta.— the first joint of the tarsus.

pleura.— the lateral surface of a segment.

pleural suture.— a distinct sinous suture which separates
the epimeron from the episternum in the mesopleuron.

pollen basket.-- see corbiculae.

pollen mill.-- see wax shears.

post-scute Hum.-- the fourth and posterior sclerite of the dorsum of the thoracic rings.

pronotum.-- the dorsal surface of the prothorax.

propodeum.-- that part of the thorax just above the insertion of the abdomen and really the first abdominal segment.

prosternum.-- the sclerite between the fore legs.

prothorax.-- the first thoracic ring or segment; it bears the anterior legs but no wings.

Psithyrus.-- name of one of the genera of the Bombidae.

pubescent.-- clothed with soft, short, fine, closely set hairs.

pulvillus.-- soft padlike structures between tarsal claws. (See Fig. 14.)

punctate.-- covered with punctures or impressed points.

queen.-- the actively reproducing female.

radial cell.-- the very elongate cell of the fore wing, bordered by costal and cubital cells; it is narrowly rounded at its anterior end and has no well developed stigma. (See Fig. 3.)

recurrent veins.-- the first recurrent vein joins the cubital opposite the middle of the second cubital. The second recurrent vein joins the cubital at a point somewhat proximad of the apex. (See Fig. 3.)

sagittae.-- a part of male genitalia; elongate slender pieces on each side between the claspers; distal ends with strongly recurved parts.

sarothrus.-- the pollen brush of the bee.
scape.-- the first joint of the antennae.

sclerite.-- any piece of the body wall bounded by sutures.

scutellum.-- the third dorsal sclerite of the meso- and meta-thorax.

scutum.-- the second dorsal sclerite of the meso- and meta-thorax.

shaft.-- part of male genitalia; in the male, the long basal part of the sagittae. In the female, a terminal tapering part of the sheath of the sting. (Fig. 37-39Y).

sheath.-- the dorsal piece of the tapering shaft which makes up the sting.

spine.-- a fine, long, rigid, pointed process.

shelf-like projection.-- a noticeable median transverse carina near the apical margin of the labrum in females of Bombus.

spathae.-- ventral and basal foliaceous sclerites. See inner and outer spathae.

spiracle bearing plate.-- a paired plate attached to and overlapping the base of the sting, bearing spiracles and appearing to represent an extra segment of the abdomen.

squama.-- a small apical dorsal piece attached to the distal end of the branch or stipes; typically two-lobed, but sometimes one or the other may be nearly reduced or absent. (Figures 33, 37, and 38 T.)

sternum.-- the middle portion of the under surface of thorax between the coxal cavities.

sting palpi.-- an elongate hairy organ attached to the palpus plate.

stipes.-- see branch.

sub-costal vein.-- the vein which borders the costal vein behind and separates it from the median cell. (Fig. 3.)
sub-discoidal vein.-- the vein separating the third discoidal cell from the first apical cell. (Fig. 3.)

sub-genus.-- a division within a genus based upon a character not sufficient for generic separation.

sub-hyaline.-- partly transparent or vitreous.

sub-median cell.-- an elongate and narrow cell just behind the median cell in the fore wing. (See Fig. 3.)

supra-antennal line.-- the line tangential to the upper sides of the antennal attachments.

supra-orbital line.-- the line tangent to the extreme upper sides of the eyes.

tarsus.-- the jointed appendage attached at the apex of the tibia. (See Fig. 14.)

tarsal claws.-- claws at the distal end of the tarsus.

tegulae.-- small, arched, chitinous plate over the bases of each of the fore wings.

tibia.-- that part of the leg articulated to the femur basally and which bears the tarsus at the distal end. (See Fig. 14.)

toothed.-- acutely angulated.

translucent area.-- a light spot or area near each end of the labrum of some females of Bombus.

transverse cubital veins.-- veins separating the cubital cells from each other. (See Fig. 3.)

transverse median vein.-- it limits the distal end of the sub-median cell. (See Fig. 3.)

trochanter.-- a sclerite between the coxae and femur. (See Fig. 14.)

tubercle-like areas.-- elevated areas at each end of the "shelf-like projection" of the abdomen of Bombus females.
type.— a single specimen forming the basis of a description, either a unique or one selected from a series.

uncus.— a part of the male genitalia; a median dorsal organ which overlaps the bases of the sagittae. It is smooth and without hair; narrowed toward the distal end which forms a hook. (See Fig. 37-39, U.)

Variant.— a specimen differing from the original species in form or color.

venter.— the lower part of the abdomen; belly.

vertex.— the external surface of the head extending from the occiput half-way down to the supra-antennal line.

volsella.— part of claspers of male genitalia sometimes called lacinia; very hairy, variable, and very large piece attached to the inner side of, and partly enclosed by, the stipes. (Fig. 33 and 38, V.)

wax shears.— the pincer-like structure formed by the hind tibia and metatarsus.

wings.— membranous reticulated organs of flight; fore wings attached to the meso-thorax; the other, hind wings, attached to the meta-thorax. (Fig. 3-6.)

worker.— the undeveloped female which does most of the work of gathering pollen and nectar and carefully caring for the young.
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Explanation of Plates.

All of the figures were photographed by Mr. Raymond Beamier, Assistant Curator of the Entomological Museum of the University of Kansas. Figure 1 was taken from a plate by F. W. L. Sladen in his book, "The Bumblebee." Figures 3, 4, and 14 are taken from "An Introduction to the Study of Rocky Mountain Bees," by T. D. A. Cockerell. Figures 8-10, 15, and 21-46 are taken from "The Bombidae of the New World," by H. J. Franklin. The remaining figures are original.

The catalogue of lettering of plates is as follows:

apl, first apical cell.  a, anal cell or vein.
ap2, second apical cell.  am, apical margin.
B, branch or stipes.
BB, bulb.
bv, basal vein.
C, cardo.
CL, clasper.
CT costal.
cu1, cubital vein.
cu2, first cubital cell.
cu3, second cubital cell.
cu4, third cubital cell.
cu5, fourth cubital cell.
d, discoidal vein.
dl, first discoidal cell.
d2, second discoidal cell.
d3, third discoidal cell.
f, fenestra.  n.  E
ff, frenal fold.
fh, frenal hooks.
FL, flagellum.
fw, fore wing.
H, head of sagitta.
hw, hind wing.
i, inner spatha.
M, median cell.
m, median vein.
ml, malar space.
MA, muscle attachment.
MU, muscles.
PR, apical projection of volsella.
rel, first recurrent vein.
re2, second recurrent vein.
S, sagitta.
sa, stigma.
SB, subcostal vein.
sd, subdiscoidal vein.
si, sinus.
SE, scape.
sm, submedian cell.
T, squama.
tc, transverse cubital vein.
tc1, first transverse cubital vein.
tc2, second transverse cubital vein.
tc3, third transverse cubital vein.
tm, transverse median vein.
U, uncus.
V, volsella or lacinia.
Y, shaft of sagitta.

ps, pulvillus.
r, radial cell.
tu, tufts of hair.
Fig. 1.- Nest of Bombus, showing larvae, cocoons, and honey-pots.

Fig. 2.- Workers of B. edwardsii Cresson, showing the large pellets of pollen which they carry on the corbiculae.
Fig. 1.

Old cocoons containing pollen

Fig. 2.
Fig. 3.—Fore wing of Bombus huntii Greene.

Fig. 4.—Fore wing of Psithyrus insularis (F. Sm.).
Fig. 5. - Fore wing of queen of B. edwardsii Cresson.

Fig. 5a. - Fore wing of worker of Bombus.

Fig. 6. - Hind wing of B. rufocinctus Cress.
Fig. 7.- Right hind leg of queen, worker, and male, (from left to right) showing comparative size and shape and spurs on tibia. Bombus edwardsii Cresson.

Fig. 8.- Flagellum of antenna of B. appositus Cresson. X 10.

Fig. 9.- Antenna of worker.

Fig. 10.- Tarsal claws of queen of B. pennsylvaniaicus De Geer. X 18.

Fig. 11.- Malar space of male of B. fraternus (F. Sm.)

Fig. 12.- Malar space of queen of B. kirbyellus Curtis.
Fig. 7.

Fig. 8

Fig. 9

Fig. 10

Fig. 11.  Fig. 12.
Fig. 13.- Nest of B. edwardsii Cress., showing the position in which it was found. (A 12-inch rule was placed in the foreground.)

Fig. 13a.- An exposure of the nest of Fig. 13 at close range.
Fig. 14.- The leg of the bee, showing nomenclature of parts.

Fig. 15.- Antenna of B. mixtus Cresson. X 24.

Figures 16 and 17.- B. edwardsii queen, showing the peculiar division of the compound eye. Figure 16 is much more enlarged than figure 17.
Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.
Fig. 18.- Vertex of *B. auricomus* (Robertson) showing location of the ocelli. (Male).

Fig. 19.- Vertex of *B. pennsylvanicus* De Geer showing the location of ocelli. (Male.)

Fig. 20.- Abdomen of *B. mixtus* Cresson, showing long hairs on the venter. (Worker).

Fig. 21.- Ventral aspect of outer spatha of male of Bombus. X 10.

Fig. 22.- Inner dorsal aspect of apical ventral abdominal segment of worker. X 10.

Fig. 23.- Inner aspect of left mandible of worker of *B. nevadensis* Cresson. X 10.

Fig. 24.- Dorsal aspect of inner and outer spathas taken together. X 10.

Fig. 25.- Hair from thorax of queen of *B. pennsylvanicus* De Geer. X 45.

Fig. 26.- Hair from the abdomen of queen of *B. pennsylvanicus* De Geer. X 85.
Fig. 27. - Inner spatha of male of B. rufocinctus Cresson. X 50.

Fig. 28. - Inner spatha of male of Psithyrus variabilis (Cresson). X 40.
Fig. 27.

Fig. 28.
Fig. 29.- Ventral aspect of right side of genitalia of B. rufocinctus Cresson. X 27.

Fig. 30.- Head of sagitta of genitalia of B. fraternus (F. Sm.). X 64.

Fig. 31.- Dorsal aspect of left side of genitalia of B. rufocinctus Cresson. X 30.

Fig. 32.- Dorsal aspect of left clasper of genitalia of P. suckleyi (Greene). X 30.
Fig. 33.- Dorsal aspect of left clasper of genitalia of *P. variabilis* (Cress.) D. T. X 35.

Fig. 34.- Ventral aspect of right side of genitalia of *P. variabilis* (Cress.) D. T. X 35.

Fig. 35.- Ventral aspect of right side of genitalia of *P. suckleyi* (Greene). X 35.

Fig. 36.- Ventral aspect of outer spatha of *P. variabilis* (Cresson) D. T. X 25.
Fig. 37.- Dorsal aspect of left side of genitalia of B. occidentalis Greene. X 24.

Fig. 38.- Ventral aspect of left side of genitalia of B. occidentalia Greene. X 24.

Fig. 39.- End of sagitta and uncus of male of B. californicus F. Sm. X 70.

Fig. 40.- Ventral aspect of outer spatha of B. rufocinctus Cresson. X 30.